

# PATENT ABSTRACTS OF JAPAN

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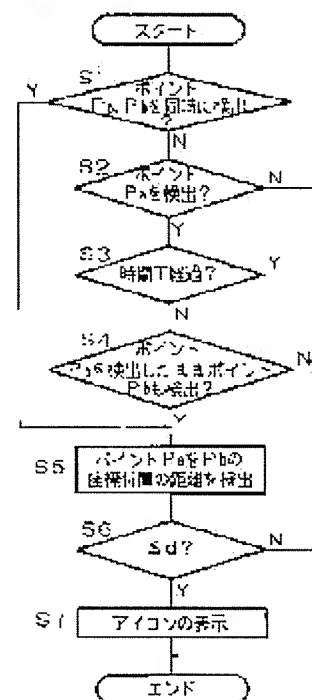
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(54) INFORMATION INPUT-OUTPUT SYSTEM, PROGRAM AND STORAGE MEDIUM

(57)Abstract:

PROBLEM TO BE SOLVED: To improve operability by operating an icon on an image screen just at hand.  
SOLUTION: A coordinate input device is arranged on the image screen of a display device being a plasma display for detecting coordinates of a position of indicating a surface of the image screen by a finger. Only when the coordinate input device detects the fact of simultaneously indicating two points of the image screen by finger (Y of Step S1, Y of S2, and Y of S4), the icon preregistered in a prescribed table is displayed in the vicinity of an indicated position (Step S7).



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CLAIMS

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[Claim(s)]

[Claim 1] It has the coordinate input unit which detects the coordinate on the screen concerned of the display which displays an image, and two or more locations to which it pointed on the screen of this display. In the information input/output system which displays said display based on the coordinate detected with said coordinate input unit When it detects pointing to two or more locations in said screen top with the storage which registers the actuation image beforehand, and said coordinate input unit Information input/output system characterized by having an actuation image display means to display the actuation image registered into said storage on the predetermined location on said screen.

[Claim 2] the time check which clocks the time amount of a between the time of pointing to said two or more locations, respectively -- a means and the 1st comparison means which judges whether it is below the predetermined time to which this clocked time amount is set beforehand -- having -- said actuation image-display means -- said time check -- the information input/output system according to claim 1 characterized by what said actuation image is displayed for on condition that time amount is below said predetermined time.

[Claim 3] Said actuation image-display means is information input/output system according to claim 1 or 2 with which it is characterized by what it has a ranging means calculate the distance between the coordinates which pointed to said two or more locations, respectively, and the 2nd comparison means which judges whether it is below the predetermined distance to which this calculated distance is set beforehand, and said actuation image is displayed for on condition that said operation distance is below said predetermined distance.

[Claim 4] It is information input/output system given in one 1 of claims 1-3 which said storage is registered about said class at least among the display positions in said display on the basis of at least one of the class of the actuation image registered, its number, and said the two or more coordinates, and are characterized by what said actuation image display means displays said actuation image for according to the contents of registration of said storage.

[Claim 5] It is the information input/output system according to claim 4 characterized by having an updating means to update the contents of registration of said storage from the contents of a reception beam concerned when the reception injury of this input is carried out, a reception means to receive the input of the contents of registration to said storage, and.

[Claim 6] It is the information input/output system according to claim 1 characterized by to have an actuation means receive and perform predetermined actuation according to detection distance and a direction concerned when there is said detection by said migration detection means, where a migration detection means point and detect the distance and the direction of migration of a location and said actuation image on said screen are displayed.

[Claim 7] Said actuation image display means is information input/output system according to claim 6 characterized by what is been what changes the display position on said screen of said actuation image according to detection distance and a direction concerned when there is detection by said migration detection means, where said actuation image is displayed.

[Claim 8] It is the information input/output system according to claim 1 characterized by to have an enlarging-or-contracting means responds in detection distance and a direction concerned, and expand or reduce the magnitude on said screen of said actuation image when there is said detection by a migration detection means point and detect the distance and the direction of migration of a location and said migration detection means on said screen.

[Claim 9] When it detects pointing to two or more locations in said screen top with said coordinate input unit A door display means to display a door on the predetermined location on said screen, and a migration detection means to point on said screen and to detect the distance and the direction of migration of a location, Where said door is displayed, when there is detection of said migration It has a door modification means to change the display position on said screen of said door according to detection distance and a direction concerned. Said actuation image display means Information input/output system according to claim 1 which is what displays that said actuation image appears gradually according to migration of the door concerned from under said door by which said display position was changed.

[Claim 10] Said actuation image is information input/output system given in one 1 of claims 1-9 characterized by what is been an icon, a dial, a slider bar, or a pallet.

[Claim 11] It is information input/output system given in one 1 of claims 1-10 to which said storage has registered two or more kinds of said actuation images, and said actuation image-display means is indicated said actuation image by said thing [ carrying out by choosing more than one from the actuation images of a class ], corresponding [ of said location to which it pointed / concerned ] to the number and whether it pointed out and the example was performed to coincidence, or it was carried out one by one.

[Claim 12] It has the coordinate input unit which detects the coordinate on the screen concerned of the display which displays an image, and two or more locations to which it pointed on the screen of this display. In the program to the computer which makes a computer perform controlling information input/output system which displays said display based on the coordinate detected with said coordinate input unit which can be read It is the program characterized by making a computer perform actuation image display processing which displays the actuation image beforehand registered into storage on the predetermined location on said screen when it detects pointing to two or more locations in said screen top with said coordinate input unit.

[Claim 13] the time check which clocks the time amount of a between the time of pointing to said two or more locations, respectively -- processing and the 1st comparison processing which judges whether it is below the predetermined time to which this clocked time amount is set beforehand perform to a computer -- making -- said actuation image-display processing -- said time check -- the program according to claim 12 characterized by what said actuation image displays for on condition that time amount is below said predetermined time.

[Claim 14] Said actuation image-display processing is the program according to claim 12 or 13 to which it is characterized by what make a computer perform the ranging processing which calculates the distance between the coordinates which pointed to said two or more locations, respectively, and the 2nd comparison processing which judges whether it is below the predetermined distance to which this calculated distance is set beforehand, and said actuation image displays for on condition that said operation distance is below said predetermined distance.

[Claim 15] Said actuation image display processing is a program given in one 1 of claims 12-14 characterized by what said actuation image is displayed for according to the contents of registration of said storage registered about said class at least among the display positions in said display on the basis of at least one of the class of the actuation image registered, its number, and said the two or more coordinates.

[Claim 16] It is the program according to claim 15 characterized by making a computer perform the update process which updates the contents of registration of said storage from the contents of a reception beam concerned when the reception injury of this input is carried out with the reception processing which receives the input of the contents of registration to said storage.

[Claim 17] It is the program according to claim 12 which carries out [ making a computer perform the



actuation processing which receives and performs predetermined actuation according to detection distance and a direction concerned, when there is said detection by said migration detection means, where said actuation image is displayed as migration detection processing in\_which point on said screen and the distance and the direction of migration of a location are detected, and ] as the description.

[Claim 18] Said actuation image display processing is a program according to claim 17 characterized by what is been what changes the display position on said screen of said actuation image according to detection distance and a direction concerned when there is detection by said migration detection means, where said actuation image is displayed.

[Claim 19] It is the program according to claim 12 which carries out [ making a computer perform the enlarging-or-contracting processing which responds in detection distance and a direction concerned, and expands or reduces the magnitude on said screen of said actuation image when there is said detection by the migration detection processing in\_which point and the distance and the direction of migration of a location are detected and said migration detection processing on said screen, and ] as the description.

[Claim 20] When it detects pointing to two or more locations in said screen top with said coordinate input unit Door display processing which displays a door on the predetermined location on said screen, and migration detection processing in which point on said screen and the distance and the direction of migration of a location are detected, Where said door is displayed, when there is detection of said migration A computer is made to perform door modification processing in which the display position on said screen of said door is changed according to detection distance and a direction concerned. Said actuation image display processing The program according to claim 12 which is what displays that said actuation image appears gradually according to migration of the door concerned from under said door by which said display position was changed.

[Claim 21] Said actuation image display processing is a program given in one 1 of claims 12-20 characterized by what an icon, a dial, a slider bar, or a pallet is displayed for as said actuation image.

[Claim 22] Said actuation image display processing is a program given in one 1 of claims 12-21 characterized by choosing the display of said actuation image from the actuation images registered into said storage two or more kinds, and performing it, corresponding [ of said location to which it pointed / concerned ] to the number and whether it pointed out and the example was performed to coincidence, or it was carried out one by one.

[Claim 23] The storage characterized by having memorized the program of a publication to one 1 of claims 12-22.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to information input/output system and a program.

[0002]

[Description of the Prior Art] It has the indicating equipment for displaying an alphabetic character and an image in recent years, the coordinate input unit which arranged the information input screen (touch panel side) in the front face of an indicating equipment, and the control unit which performs the display control of an indicating equipment based on the input from a coordinate input unit, and the information input/output system which constituted the screen and the write-in field of an electronic blackboard using the indicating equipment and the coordinate input unit is offered.

[0003] for example, made in Smart Technologies (SMART Technologies Inc.) is smart -- 2000 is in the condition which projected the image of an alphabetic character, a picture, a graphic form, and a graphic on the panel using the liquid crystal projector connected to the computer, and performs processing which downloads the information on handwritten to a computer using the coordinate input unit (write-in field) arranged in the front face of the plane of projection (screen) of a panel. And handwritten information and image information are compounded within a computer, and it enables it to express as real time through a liquid crystal projector again.

[0004] Since the image inputted using the coordinate input unit can be displayed in piles as an overwrite image to the image on the screen currently displayed with the display, at a meeting, a presentation, schools, etc., it is already used widely, and the use effectiveness is highly estimated by such information input/output system. Moreover, it is used also as a teleconference by including communication facility, such as voice and an image, in such information input/output system, and connecting between remote places by the communication line.

[0005] Moreover, the technique of various methods is proposed as a coordinate input unit used for such information input/output system. That is, the optical thing besides [ which has a physical field like a touch panel side as this coordinate input device ] a method is proposed (for example, refer to JP,11-110116,A).

[0006]

[Problem(s) to be Solved by the Invention] By the way, when operating various applications etc. on that screen using the above information input/output system, it is possible to carry out by displaying a tool bar on a screen, and carrying out by pointing to the icon on this tool bar by directions members, such as a finger and a pen, or operating remote control of dedication. When pointing to an icon by the directions member, a coordinate input unit detects the coordinate of the location to which the directions member concerned points, and it judges to which icon it is pointing.

[0007] The display used with information input/output system However, 40 inches, If the thing of the big screen of 50 inches is assumed and it is going to point to the icon of the tool bar on a screen (usually displayed on the upper and lower sides of a screen, or an edge on either side) by the directions member Compromise to the location where the desired icon is displayed, or [ lengthening the limbs greatly one

by one, in order that a user may operate an icon ] Or it is necessary to start specially, whenever it clicks on an icon, in sitting on a chair and operating it, and there is fault that actuation is very complicated.

[0008] Moreover, in operating [ since it cannot be operated on the screen of information input/output system when operating it with remote control of dedication as mentioned above, while looking at a screen, or ] it, explaining, there is fault that actuation is very complicated too.

[0009] The purpose of this invention is making it possible to operate an icon on a screen at hand immediately, and raising operability.

[0010] Another purpose of this invention is enabling it for the actuation performed by pointing to one on a screen to distinguish easily, when raising this operability.

[0011] Another purpose of this invention is enabling it to distinguish easily the case where it points to two or more [ on a screen ], without aiming at the display of an icon, when raising the aforementioned operability.

[0012] Another purpose of this invention is enabling it to display an icon in the class, number, or display position which is registered beforehand in the aforementioned case.

[0013] Another purpose of this invention is raising operability further, as a user's can register with a request about the detail of the icon which is displayed in the aforementioned case.

[0014] Another purpose of this invention is that point on a screen and a user enables it to perform predetermined actuation by migration of a location.

[0015] Another purpose of this invention is enabling it to display that it pointed on the screen and the actuation image was operated according to migration of a location.

[0016] Another purpose of this invention is making an actuation image easy to expand, to reduce to desired size easily, and to operate it.

[0017] Another purpose of this invention is displaying various kinds of actuation images alternatively by the difference in how on a screen pointing.

[0018]

[Means for Solving the Problem] Invention according to claim 1 is equipped with the coordinate input unit which detects the coordinate on the screen concerned of the display which displays an image, and two or more locations to which it pointed on the screen of this display. In the information input/output system which displays said display based on the coordinate detected with said coordinate input unit When it detects pointing to two or more locations in said screen top with the storage which registers the actuation image beforehand, and said coordinate input unit It is the information input/output system characterized by having an actuation image display means to display the actuation image registered into the predetermined location on said screen.

[0019] In this specification, it is the graphic form displayed on a screen, and by performing predetermined actuation with a finger etc. to that graphic form, an actuation image receives that a user performs various actuation to information input/output system, and are an icon, a dial, a slider bar, a pallet, etc.

[0020] Therefore, by easy actuation which points to two or more [ on a screen ] with the finger of one hand etc., since a required actuation image can be displayed near the location to which it pointed etc., an actuation image can be immediately operated on a screen at hand, and operability can be raised. And since there is no display of an actuation image in pointing to one on a screen, it is easily distinguishable from the actuation performed by pointing to one place.

[0021] the time check which clocks the time amount of a between the time of invention according to claim 2 pointing to said two or more locations in invention according to claim 1, respectively -- a means and the 1st comparison means which judges whether it is below the predetermined time to which this clocked time amount is set beforehand -- having -- said actuation image-display means -- said time check -- it is characterized by what said actuation image displays for on condition that time amount is below said predetermined time.

[0022] Therefore, since an actuation image is not displayed when a certain amount of time interval is opened and it points one by one to two or more [ on a screen ], the case where it points to two or more [ on a screen ], without aiming at the display of an actuation image is easily distinguishable.

[0023] A ranging means by which invention according to claim 3 calculates the distance between the coordinates which pointed to said two or more locations, respectively in invention according to claim 1 or 2, It has the 2nd comparison means which judges whether it is below the predetermined distance to which this calculated distance is set beforehand, and said actuation image display means is characterized by what said actuation image is displayed for on condition that said operation distance is said below predetermined distance.

[0024] Therefore, since an actuation image is not displayed when a certain amount of distance spacing is opened and it points to two or more [ on a screen ], the case where it points to two or more [ on a screen ], without aiming at the display of an actuation image is easily distinguishable.

[0025] Invention according to claim 4 is set to invention given in one 1 of claims 1-3. Said storage It is registered about said class at least among the display positions in said display on the basis of at least one of the class of the actuation image registered, its number, and said the two or more coordinates. Said actuation image display means is characterized by what said actuation image is displayed for according to the contents of registration of said storage.

[0026] Therefore, an actuation image can be displayed in the class, number, or display position registered beforehand.

[0027] In invention according to claim 4, invention according to claim 5 is characterized by having an updating means to update the contents of registration of said storage from the contents of a reception beam concerned, when the reception injury of this input is carried out, a reception means to receive the input of the contents of registration to said storage, and.

[0028] Therefore, since it can register with a request of a user about the detail of the actuation image to display, operability can be raised further.

[0029] Invention according to claim 6 carries out having an actuation means receive and perform predetermined actuation according to detection distance and a direction concerned as the description in invention according to claim 1, when there is said detection by said migration detection means, where a migration detection means point and detect the distance and the direction of migration of a location and said actuation image on said screen are displayed.

[0030] Therefore, it points on a screen and a user can perform predetermined actuation by migration of a location.

[0031] In invention according to claim 6, invention according to claim 7 is characterized by what the display position on said screen of said actuation image is changed for according to detection distance and a direction concerned, when said actuation image display means has detection by said migration detection means, where said actuation image is displayed.

[0032] Therefore, it can be made to display that it pointed on the screen and the actuation image was operated according to migration of a location.

[0033] Invention according to claim 8 is characterized by to have an enlarging-or-contracting means responds in detection distance and a direction concerned, and expand or reduce the magnitude on said screen of said actuation image in invention according to claim 1, when there is said detection by a migration detection means point and detect the distance and the direction of migration of a location and said migration detection means on said screen.

[0034] Therefore, an actuation image can be made easy to expand, to reduce to desired size easily, and to operate it.

[0035] When it detects pointing to two or more locations in said screen top with said coordinate input unit in invention according to claim 1, invention according to claim 9 A door display means to display a door on the predetermined location on said screen, and a migration detection means to point on said screen and to detect the distance and the direction of migration of a location, Where said door is displayed, when there is detection of said migration Having a door modification means to change the display position on said screen of said door according to detection distance and a direction concerned, said actuation image display means displays that said actuation image appears gradually according to migration of the door concerned from under said door by which said display position was changed.

[0036] Therefore, it is suitable when it points to two or more locations in a screen top, and displaying an

actuation image not to not much show immediately, since an actuation image can be displayed from under the door which moves gradually if the location to which did not display an actuation image but it pointed is moved.

[0037] Invention according to claim 10 is characterized by what said actuation image is an icon, a dial, a slider bar, or a pallet in invention given in one 1 of claims 1-9.

[0038] Therefore, an icon, a dial, a slider bar, or a pallet can be used as an actuation image.

[0039] Invention according to claim 11 is set to invention given in one 1 of claims 1-10. Said storage Having registered two or more kinds of said actuation images, said actuation image display means is indicated said actuation image by said thing [ carrying out by choosing more than one from the actuation images of a class ], corresponding [ of said location to which it pointed / concerned ] to the number and whether it pointed out and the example was performed to coincidence, or it was carried out one by one.

[0040] Therefore, various kinds of actuation images can be alternatively displayed by the difference in how on a screen to point.

[0041] Invention according to claim 12 is equipped with the coordinate input unit which detects the coordinate on the screen concerned of the display which displays an image, and two or more locations to which it pointed on the screen of this display. In the program to the computer which makes a computer perform controlling information input/output system which displays said display based on the coordinate detected with said coordinate input unit which can be read When it detects pointing to two or more locations in said screen top with said coordinate input unit, it is the program characterized by making a computer perform actuation image display processing which displays the actuation image beforehand registered into storage on the predetermined location on said screen.

[0042] Therefore, by easy actuation which points to two or more [ on a screen ] with the finger of one hand etc., since a required actuation image can be displayed near the location to which it pointed etc., an actuation image can be immediately operated on a screen at hand, and operability can be raised. And since there is no display of an actuation image in pointing to one on a screen, it is easily distinguishable from the actuation performed by pointing to one place.

[0043] the time check which clocks the time amount of a between the time of invention according to claim 13 pointing to said two or more locations in invention according to claim 12, respectively -- with processing 1st comparison processing which judges whether it is below the predetermined time to which this clocked time amount is set beforehand is performed to a computer -- making -- said actuation image display processing -- said time check -- it is characterized by what said actuation image is displayed for on condition that time amount is said below predetermined time.

[0044] Therefore, since an actuation image is not displayed when a certain amount of time interval is opened and it points one by one to two or more [ on a screen ], the case where it points to two or more [ on a screen ], without aiming at the display of an actuation image is easily distinguishable.

[0045] Invention according to claim 14 is set to invention according to claim 12 or 13. The ranging processing which calculates the distance between the coordinates which pointed to said two or more locations, respectively, A computer is made to perform 2nd comparison processing which judges whether it is below the predetermined distance to which this calculated distance is set beforehand, and said actuation image display processing is characterized by what said actuation image is displayed for on condition that said operation distance is said below predetermined distance.

[0046] Therefore, since an actuation image is not displayed when a certain amount of distance spacing is opened and it points to two or more [ on a screen ], the case where it points to two or more [ on a screen ], without aiming at the display of an actuation image is easily distinguishable.

[0047] Invention according to claim 15 is set to invention given in one 1 of claims 12-14. Said actuation image display processing It is characterized by what said actuation image is displayed [ among the display positions in said display on the basis of at least one of the class of the actuation image registered, its number, and said the two or more coordinates ] for according to the contents of registration of said storage registered about said class at least.

[0048] Therefore, an actuation image can be displayed in the class, number, or display position registered beforehand.

[0049] In invention according to claim 15, invention according to claim 16 is characterized by making a computer perform the update process which updates the contents of registration of said storage from the contents of a reception beam concerned, when the reception injury of this input is carried out with the reception processing which receives the input of the contents of registration to said storage.

[0050] Therefore, since it can register with a request of a user about the detail of the actuation image to display, operability can be raised further.

[0051] Invention according to claim 17 makes a computer perform migration detection processing of pointing on said screen and detecting the distance and the direction of migration of a location in invention according to claim 12, and actuation image-display processing carries out what it is what changes the display position on said screen of said actuation image according to detection distance and a direction concerned as the description, when this detection is in the condition that said actuation image was displayed.

[0052] Therefore, it points on a screen and a user can perform predetermined actuation by migration of a location.

[0053] In invention according to claim 17, invention according to claim 18 is characterized by making a computer perform actuation processing which receives and performs predetermined actuation according to detection distance and a direction concerned, when there is said detection by said migration detection means, where said actuation image is displayed.

[0054] Therefore, it can be made to display that it pointed on the screen and the actuation image was operated according to migration of a location.

[0055] It carries out that invention according to claim 19 makes a computer perform the enlarging-or-contracting processing which responds in detection distance and a direction concerned, and expands or reduces in the magnitude on said screen of said actuation image when there is said detection by the migration detection processing in which point and the distance and the direction of migration of a location are detected and said migration detection processing on said screen, in invention according to claim 12 as the description.

[0056] Therefore, an actuation image can be made easy to expand, to reduce to desired size easily, and to operate it.

[0057] When it detects pointing to two or more locations in said screen top with said coordinate input unit in invention according to claim 12, invention according to claim 20 Door display processing which displays a door on the predetermined location on said screen, and migration detection processing in which point on said screen and the distance and the direction of migration of a location are detected, Where said door is displayed, when there is detection of said migration A computer is made to perform door modification processing in which the display position on said screen of said door is changed according to detection distance and a direction concerned. Said actuation image display processing It is displayed that said actuation image appears gradually according to migration of the door concerned from under said door by which said display position was changed.

[0058] Therefore, it is suitable when it points to two or more locations in a screen top, and displaying an actuation image not to not much show immediately, since an actuation image can be displayed from under the door which moves gradually if the location to which did not display an actuation image but it pointed is moved.

[0059] Invention according to claim 21 is characterized by what said actuation image display processing displays an icon, a dial, a slider bar, or a pallet for as said actuation image in invention given in one 1 of claims 12-20.

[0060] Therefore, an icon, a dial, a slider bar, or a pallet can be used as an actuation image.

[0061] It is characterized by carrying out by invention according to claim 22 choosing in invention given in one 1 of claims 12-21 from the actuation images with which two or more kinds of said actuation image display processings are registered into said storage in the display of said actuation image, corresponding [ of said location to which it pointed / concerned ] to the number and whether it pointed out and the example was performed to coincidence, or it was carried out one by one.

[0062] Therefore, various kinds of actuation images can be alternatively displayed by the difference in



how on a screen to point.

[0063] Invention according to claim 23 is a storage characterized by having memorized the program of a publication to one 1 of claims 12-22.

[0064] Therefore, the same operation as invention of a publication and effectiveness can be done so to one 1 of claims 12-22.

[0065]

[Embodiment of the Invention] The gestalt of 1 implementation of this invention is explained.

[0066] Drawing 1 is the appearance perspective view showing roughly the information input/output system 1 which is the gestalt of this operation, and drawing 2 is the block diagram showing electric connection of the information input/output system 1. As shown in drawing 1 and drawing 2, the information input/output system 1 is equipped with the panel section 4 which is the I/O device which consists of the plasma display panels (PDP) 2 and the coordinate input units 3 which are an indicating equipment, the computers 5, such as a personal computer, the scanner 6 for reading the image of a manuscript, the printer 7 that outputs image data to the detail paper, and the device stowage 9 which contains a video player 8.

[0067] PDP2 is a thing big screen type [, such as 40 inches available as an electronic blackboard and 50 etc. inches, ], and CRT, LCD, etc. may be used for it as long as it is this big screen type of display. Moreover, although illustration is omitted, the video input terminal and the loudspeaker are formed in PDP2, and a video player 8 is begun, in addition various information machines and equipment and AV equipments, such as a laser disk player, a DVD player, and a video camera, are connected, and it has composition which can use PDP2 as a big screen monitor.

[0068] As shown in drawing 2, the information input/output system 1 is a configuration which connects PDP2, a scanner 6, a printer 7, and a video player 8 to a computer 5, respectively, and controls the whole system by the computer 5. Moreover, the controller 10 for coordinate input unit 3 which performs the operation of the position coordinate in information input area 3a directed by predetermined bodies, such as directions members, such as a pen, and a fingertip, etc. is connected to the computer 5, and the coordinate input unit 3 is also connected to the computer 5 through this controller 10. Moreover, it is also possible to transmit the data which could connect the information input/output system 1 to the network 11 through the computer 5, and displayed the data created by other computers connected on the network 11 on PDP2, or were created with the information input/output system 1 to other computers.

[0069] Next, a computer 5 is explained. Here, drawing 3 is the block diagram showing the electrical installation of each part built in a computer 5. As shown in drawing 3, CPU12 by which a computer 5 controls the whole system, and RAM14 used as a work area of ROM13 and CPU12 which recorded the bootstrap etc. are connected through the bus 21. Moreover, the keyboard 15 for inputting an alphabetic character, a numeric value, various directions, etc. into a bus 21 through a predetermined interface, The mouse 16 for performing migration, a range selection, etc. of cursor, and the hard disk 17 which is a store, With the graphics board 18 which is connected to PDP2 and controls the display of the image to the PDP2 The interface (I/F) 20 for the network card (or modem) 19 for connecting with a network 11 being connected, and connecting controller 10, scanner 6, and printer 7 grade is also connected.

[0070] Various application program 24 grades, such as the device driver 23 for operating the coordinate input device 3 on a computer 5 through an operating system (OS) 22 and a controller 10, and drawing software word processor software, spreadsheet software presentation software calibration software, are stored in the hard disk 17.

[0071] moreover, the record medium 26 (a flexible disk --) which recorded various kinds of program codes (control program) of OS22, a device driver 23, or various application program 24 grades on the computer 5 A hard disk, an optical disk (CD-ROM, CD-R, CD-R/W, DVD-ROM, DVD-RAM, etc.), The program reader 25 (it responds to the recording method of a record medium 26) which is equipment which reads the program code currently recorded for the ability using various kinds of media, such as a magneto-optic disk (MO) and a memory card equipments, such as flexible disk drive equipment, CD-ROM drive equipment, and MO drive equipment, -- it can use -- it is carried.

[0072] The various application programs 24 are executed by CPU12 under control by OS22 started

according to the injection of the power source to a computer 5. For example, when drawing software is started by predetermined actuation of a keyboard 15 and a mouse 16, the predetermined image based on drawing software is displayed on PDP2 through a graphics board 18. Moreover, a device driver 23 is also started with OS22, and will be in the condition in which the data input from the coordinate input device 3 through a controller 10 is possible. Thus, where drawing software is started, when a user traced and draws an alphabetic character, a graphic form, etc. on information input area 3a of the coordinate input unit 3 by directions members, such as a finger, Rhine to which the migration locus of a directions member is connected to the image on the screen where the coordinate information on the migration locus of the directions member is inputted into a computer 5 as image data, for example, is displayed on PDP2 is displayed in piles as an overwrite image. Or the image of the field to which the migration locus of a directions member is connected conversely is eliminated. And he is trying for the location on screen 2a of PDP2 which displays this image in piles or eliminates an image to lap with the location which the user traced and drew by directions members, such as a finger, by information input area 3a.

[0073] If the case where a line and an alphabetic character are overwritten is explained more to a detail at an example, CPU12 of a computer 5 writes the drawing information for drawing a line and an alphabetic character based on the inputted image data in the video memory (not shown) which generates and is prepared for a graphics board 18 according to the position coordinate based on the inputted coordinate information. Then, when a graphics board 18 transmits to PDP2 by making into a picture signal drawing information written in video memory, the same alphabetic character as the alphabetic character written by the user will be displayed on PDP2. That is, since the computer 5 recognizes the coordinate input device 3 as a pointing device like a mouse 16, by computer 5, the same processing as the case where an alphabetic character is written using a mouse 16 on drawing software will be performed.

[0074] Next, the coordinate input unit 3 is explained to a detail. In addition, as a coordinate input unit 3 which can be applied to the information input/output system 1 of the gestalt of this operation, the thing of the various methods with which detection methods differ can be considered. For example, a touch panel can be mentioned as a coordinate input device 3 which detects mechanically and electrically the coordinate location to which a directions member points on screen 2a of PDP2 (information input area 3a).

[0075] However, below, five things (1st coordinate input unit 3A- 5th coordinate input unit 3E) from which a detection method differs are mentioned about the coordinate input unit 3 which detects optically the coordinate location to which a directions member points as a more suitable example on screen 2a of PDP2 (information input area 3a), and the configuration and principle are explained.

[0076] A. Explain the 1st coordinate input unit \*\*\*\* and 1st coordinate input unit 3A based on drawing 4 - drawing 8 . The so-called recursive light electric shielding method is used for this 1st coordinate input unit 3A.

[0077] Here, drawing 4 is the explanatory view showing roughly the configuration of 1st coordinate input unit 3A. As shown in drawing 4 , coordinate input unit 3A is equipped with information input area 3a of the shape of an oblong square in the size corresponding to the size of screen 2a of PDP2. This information input area 3a is a field which enables the input of an alphabetic character, a graphic form, etc. by tracing with a finger etc. Near the corner located in the lower part both ends of this information input area 3a, the optical unit 27 (left-hand side optical unit 27L, right-hand side optical unit 27R) which performs luminescence and light-receiving is formed by whenever [ predetermined champing-angle ]. From these optical units 27, by the shape of a sector which consists of a flat surface or a bundle of light (probe light) almost of nothing, for example, L1, L2, L3, ..., Ln (R1, R2, R3, ..., Rn), for a flat surface, the thin film-like flux of light film is floodlighted in parallel along the front face of screen 2a of PDP2 so that it may spread throughout information input area 3a.

[0078] Moreover, the recurrence reflective member 28 is formed in the periphery except the lower part of information input area 3a of the coordinate input unit 3. This recurrence reflective member 28 arranges many cube corner reflectors of for example, a cone configuration, and is formed, and it has the property reflected towards a position, without depending the light which carried out incidence on



whenever [ that incident angle ]. For example, it will be reflected by the recurrence reflective member 28 and the probe light L3 floodlighted from left-hand side optical unit 27L will be received by left-hand side optical unit 27L as retroreflection light L3' which follows the same optical path again. That is, information input area 3a is formed also of the recurrence reflective member 28.

[0079] Next, the optical unit 27 is explained. Here, drawing 5 is the block diagram showing the structure of the optical unit 27 roughly. In addition, although drawing 5 shows the subject the direction of x-z, it is drawing which looked at the component same about the part shown with a two-dot chain line from another (the direction of x-y, or the direction of y-z).

[0080] As shown in drawing 5, the optical unit 27 is equipped with the floodlighting means 29 and the light-receiving means 30. The floodlighting means 29 is equipped with the light sources 31, such as possible LD (LaserDiode) of extracting a spot to some extent, and Pinpoint LED (Light Emitting Diode). The light perpendicularly irradiated from this light source 31 to screen 2a of PDP2 is collimated in the x directions by the cylindrical lens 32 which can change only the scale factor of an one direction. The light collimated by the cylindrical lens 32 in the x directions is condensed to the direction of y by the cylindrical lenses 33 and 34 of two sheets the cylindrical lenses and distribution of curvature cross at right angles in a cylindrical lens 32. That is, the field which condensed the light from the light source 31 to the line will be formed behind a cylindrical lens 34 of an operation of these cylindrical-lens groups (cylindrical lenses 32, 33, and 34). The slit plate 35 which has a narrow slit long and slender in x directions in the direction of y is arranged here. Therefore, the light which passed the cylindrical-lens group (cylindrical lenses 32, 33, and 34) forms the linear secondary light source 36 in the slit location of the slit plate 35. The light emitted from the secondary light source 36 is turned up by the half mirror 37, it is the parallel light which met the front face of screen 2a, without spreading in the perpendicular direction of screen 2a of PDP2, and as in parallel as screen 2a, serves as flux of light film of the shape of a sector centering on the secondary light source 36, and advances information input area 3a. If it puts in another way, sector-like light will form information input area 3a. Condensing optical system is formed with these cylindrical-lens groups (cylindrical lenses 32, 33, and 34) and slit plates 35.

[0081] As mentioned above, it will be recursively reflected by the recurrence reflective member 28, and the flux of light film which became sector-like and ran information input area 3a will follow the same optical path again, and will return to a half mirror 37. Therefore, the flux of light film recursively reflected by the recurrence reflective member 28 also forms information input area 3a.

[0082] The retroreflection light which was reflected by the recurrence reflective member 28 and returned to the half mirror 37 penetrates a half mirror 37, and it carries out incidence to the light-receiving means 30. After retroreflection light which carried out incidence to the light-receiving means 30 is made into a line through the cylindrical lens 38 which is a condenser lens, it is received in a location which is different for every probe light in CCD39 prepared at intervals of distance f (f is the focal distance of a cylindrical lens 38) from this cylindrical lens 38. In addition, CCD39 of the gestalt of this operation is 1-dimensional CCD, and the number of pixels is made into 2,048 pixels.

[0083] In the direction of the z-axis, the retroreflection light reflected in the detail by the recurrence reflective member 28 does not receive an operation of a cylindrical lens 38, but while it had been collimated by it, it reaches CCD39. Moreover, image formation of the retroreflection light is carried out on CCD39 which spread so that it might condense at the core of a cylindrical lens 38 with screen 2a of PDP2, if parallel, consequently was installed in the focal plane of a cylindrical lens 38 in response to the operation of a cylindrical lens 38. Thereby, according to the existence of retroreflection light, distribution of optical reinforcement is formed on CCD39. That is, when retroreflection light is interrupted by the directions member P, the point (peak point mentioned later) that optical reinforcement is weak will arise in the location equivalent to the retroreflection light by which it was interrupted on CCD39. CCD39 which received retroreflection light generates the electrical signal based on the optical intensity distribution of retroreflection light (probe light), and outputs it to the controller 10 mentioned above. In addition, as shown in drawing 5, both the secondary light source 36 and the cylindrical lens 38 are arranged in the location of distance d to a half mirror 37, and are in physical relationship [ \*\*\*\* ].

[0084] Here, drawing 6 is the block diagram of the controller 10 which performs processing which specifies the coordinate of the location where the light which the electrical signal based on the optical intensity distribution of retroreflection light is inputted from a photo detector 39, and advances information input area 3a was interrupted. This controller 10 calculates luminescence control of the light source (LD) 31 of the optical unit 27 (left-hand side optical unit 27L, right-hand side optical unit 27R), and the output from CCD39 of the optical unit 27 (left-hand side optical unit 27L, right-hand side optical unit 27R). As shown in drawing 6, the bus connection of the interface 43, A/D converter 44, and the LD driver 45 for connecting with ROM41 which CPU40 which controls each part intensively is formed in the controller 10, and records a program and data on this CPU40, RAM42 which stores various data, enabling free rewriting and functions as a work area, and a computer 5 is carried out. Moreover, the bus connection of EEPROM47 which is the memory of a hard disk 46 or a non-volatile which stores various kinds of program codes (control program) is carried out to CPU40. The microcomputer is constituted by CPU40, ROM41, and RAM42 here. The program readers 48, such as flexible disk drive equipment which is equipment which reads the program code currently recorded on the record medium 49 which recorded various kinds of program codes (control program), i.e., a flexible disk, a hard disk, optical disks (CD-ROM, CD-R, CD-R/W, DVD-ROM, DVD-RAM, etc.), the magneto-optic disk (MO), the memory card, etc., CD-ROM drive equipment, and MO drive equipment, are connected to such a microcomputer.

[0085] As a circuit which calculates the output from CCD39, the analog processing circuit 51 is connected to the output terminal of CCD39, as shown in drawing. Within CCD39, the reflected light which carried out incidence to CCD39 is changed into the image data of an analog with the electrical-potential-difference value according to luminous intensity, and is outputted as an analog signal. After this analog signal is processed in the analog processing circuit 51, it is changed into a digital signal by A/D converter 44, and is passed to CPU40. Then, the operation of the 2-dimensional coordinate of the directions member P is performed by CPU40.

[0086] Various kinds of program codes (control program) recorded on various kinds of program codes (control program) or record media 49 which were stored in the hard disk 46 will be written in RAM42 according to the injection of the power source to a controller 10, and various kinds of program codes (control program) will be performed.

[0087] Then, the function performed by CPU40 based on a control program is explained. Here, the coordinate detection processing which is the features-function with which the coordinate input unit 3 of the gestalt of this operation is equipped is explained concretely below.

[0088] Here, drawing 7 is the front view showing an example which pointed by the directions member P to one in information input area 3a of the coordinate input unit 3. When the n-th probe light  $L_n$  is interrupted by the directions member P in the light of the shape of a sector which consists of probe light called  $L_1, L_2, L_3, \dots, L_n$  which were irradiated from left-hand side optical unit 27L as shown in drawing 7 for example, the probe light  $L_n$  does not reach the recurrence reflective member 28.

[0089] At this time, the optical intensity distribution on CCD39 are considered. Here, drawing 8 is the explanatory view showing detection actuation of CCD39 typically. Although the optical intensity distribution on CCD39 are almost fixed if the directions member P is not inserted into information input area 3a Since the probe light  $L_n$  is not received by CCD39 of the optical unit 27 when the directions member P is inserted into information input area 3a and the probe light  $L_n$  is interrupted by the directions member P, as shown in drawing 8, The position  $X_n$  on CCD39 of the optical unit 27 corresponding to the probe light  $L_n$  serves as a field (scotoma) where optical reinforcement is weak. Since the location  $X_n$  which is the field (scotoma) where this optical reinforcement is weak will appear in the wave of the optical reinforcement outputted from CCD39 as a peak point, CPU40 recognizes the appearance of the peak point in the wave of such optical reinforcement by change of an electrical potential difference, and it detects the location  $X_n$  of the scotoma used as the wave-like peak point of this optical reinforcement.

[0090] Moreover, detection of the scotoma location  $X_n$  used as the wave-like peak point of optical reinforcement detects the distance from the scotoma location  $X_n$  to the main pixel of CCD39 based on

the pixel number (for example, setting to drawing 8 the pixel number m) of CCD39.

[0091] The location  $X_n$  (the CCD39 top of left-hand side optical unit 27L the  $X_{nL}$  and CCD39 top of right-hand side optical unit 27R  $X_{nR}$ ) which is the field (scotoma) where optical reinforcement is weak corresponds with the outgoing radiation / incident angle  $\theta_n$  of the interrupted probe light, and can know  $\theta_n$  by detecting  $X_n$ . That is, when distance from the scotoma location  $X_n$  to the main pixel of CCD39 is set to  $a$ ,  $\theta_n$  is a function of  $a$ .  $\theta_n = \tan^{-1}(a/f)$  ..... (1)

It can express. However,  $f$  is the focal distance of a cylindrical lens 38.  $\theta_n$  in left-hand side optical unit 27L is replaced with  $\theta_{nL}$  here, and  $a$  is replaced with  $X_{nL}$ .

[0092] Furthermore, it is  $\theta_{nL} = g(\theta_n)$  as a function of  $X_{nL}$  asked for include-angle  $\theta_{nL}$  of the directions member P and left-hand side optical unit 27L to make by (1) formula in drawing 7 with the transform coefficient  $g$  of the geometric relative-position relation between left-hand side optical unit 27L and information input area 3a. .... (2)

However, it can express  $\theta_{nL} = \tan^{-1}(X_{nL}/f)$ .

[0093] Similarly, the notation L in above-mentioned (1) (2) type is transposed to Notation R also about right-hand side optical unit 27R, and it is  $\theta_{nR} = h(\theta_n)$  by the transform coefficient  $h$  of the geometric relative-position relation between right-hand side optical unit 27R and information input area 3a. .... (3)

However, it can express  $\theta_{nR} = \tan^{-1}(X_{nR}/f)$ .

[0094] If [ here ]  $w$  which shows the distance of the center position of CCD39 of left-hand side optical unit 27L, and the center position of CCD39 of right-hand side optical unit 27R to drawing 7, the two-dimensional coordinate (x y) of the point directed by the directions member P in information input area 3a is the principle of triangulation.  $X = w - \tan\theta_{nR} / (\tan\theta_{nL} + \tan\theta_{nR})$  ..... (4)

$Y = w - \tan\theta_{nL} - \tan\theta_{nR} / (\tan\theta_{nL} + \tan\theta_{nR})$  .... (5)

It is computable by carrying out.

[0095] These (1), (2), (3), (4), and (5) types are beforehand stored in the hard disk 46 or the record medium 49 as a part of control program, and the position coordinate (x y) of the directions member P is computed by (1), (2), (3), (4), and (5) type as a function of  $X_{nL}$  and  $X_{nR}$ . That is, the position coordinate (x y) of the directions member P will be computed by detecting the location of the scotoma on CCD39 of left-hand side optical unit 27L, and the location of the scotoma on CCD39 of right-hand side optical unit 27R.

[0096] Thus, the position coordinate (x y) of the computed directions member P will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.

[0097] And according to such coordinate input unit 3A, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparency, and high drawing.

[0098] B. Explain the 2nd coordinate input unit, next coordinate input unit of \*\* 2nd 3B based on drawing 9 - drawing 11. In addition, about the same part as the part explained by 1st coordinate input unit 3A, explanation is also omitted using the same sign.

[0099] This 2nd coordinate input unit 3B is the so-called coordinate input unit of a recursive light reflex method.

[0100] Here, drawing 9 is the perspective view showing the directions member 61 used for coordinate input unit 3B. Moreover, drawing 10 is the front view showing an example which pointed by the directions member 61 to one in information input area 3a of coordinate input unit 3B. The recurrence reflective member 62 is formed near the tip of the directions member 61 used in order to point to one in information input area 3a of coordinate input unit 3B, as shown in drawing 9. This recurrence reflective member 62 arranges many cube corner reflectors of for example, a cone configuration, and is formed, and it has the property reflected towards a position, without depending the light which carried out incidence on whenever [ that incident angle ]. For example, it will be reflected by the recurrence reflective member 62 and the probe light  $L_n$  floodlighted from left-hand side optical unit 27L will be received by left-hand side optical unit 27L as retroreflection light  $L_{n'}$  which follows the same optical path again, as shown in drawing 10. Therefore, as shown in drawing 10, in coordinate input unit 3B, it is not necessary to form the recurrence reflective member 28 in information input area 3a like coordinate

input unit 3A mentioned above. In addition, the directions member 61 is carrying out the pen-like configuration, and its quality of the materials, such as rubber and plastics, are more desirable than glossy metal.

[0101] Therefore, it inserts in the suitable location (x y) of information input area 3a of coordinate input unit 3B near [ equipped with the recurrence reflective member 62 of such a directions member 61 ] the tip. For example, when the probe light Ln in the flux of light film of the shape of a sector floodlighted from left-hand side optical unit 27L is reflected by the recurrence reflective member 62 of the directions member 61, the retroreflection light Ln' is received by CCD39 of left-hand side optical unit 27L. Thus, when CCD39 receives retroreflection light Ln', the position Dn on CCD39 corresponding to retroreflection light Ln' serves as a field (bright point) where optical reinforcement is strong. That is, as shown in drawing 11, on CCD39, the field where optical reinforcement is strong is generated in the location of a location Dn, and a peak appears in the configuration of the luminous-intensity distribution from CCD39. The location Dn where this peak appears corresponds with the outgoing radiation / incident angle  $\theta$  of the reflected probe light, and can know  $\theta$  by detecting Dn. That is, the position coordinate (x y) of the directions member 61 will be computed by the technique of triangulation based on the peak which appears in the wave of optical reinforcement like coordinate input unit 3A of a recursive light electric shielding method which mentioned above also in coordinate input unit 3B of such a recursive light reflex method.

[0102] Thus, the position coordinate (x y) of the computed directions member 61 will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.

[0103] And according to such coordinate input unit 3B, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparency, and high drawing. In addition, not using the above directions members 61, a finger etc. can also be used as a directions member.

[0104] C. Explain the 3rd coordinate input unit, next 3rd coordinate input unit 3C based on drawing 12 - drawing 14. In addition, about the same part as the part explained by 1st coordinate input unit 3A, explanation is also omitted using the same sign.

[0105] This 3rd coordinate input unit 3C is the modification of the optical unit in 1st coordinate input unit 3A. Although the sector-like flux of light film was floodlighted in the detail in the optical unit 27 used by 1st coordinate input unit 3A and the information input area was formed in it, in coordinate input unit 3C, it has rotation scan systems, such as a polygon mirror, and the optical unit 70 which floodlights to a radial the light beam in which outgoing radiation was carried out by the rotation scan system from the light source, and forms an information input area is used.

[0106] Here, drawing 12 is the top view showing the optical unit 70 roughly. As shown in drawing 12, it has floodlighting means 70a which consists of LD (Laser Diode) 71, the half mirror 72 and the polygon mirror 73 which are the light source which the optical unit 70 has a drive circuit (not shown), and carries out outgoing radiation of the laser beam, and a condenser lens 74, and a photo detector 75. The photo detector 75 consists of PDs (Photo Diode) prepared from the condenser lens 74 at intervals of distance f (f is the focal distance of a condenser lens 74). Such an optical unit 70 carries out sequential reflection at a radial by the polygon mirror 73 in which a rotation drive is carried out by the pulse motor (not shown) by predetermined angular-velocity  $\omega$ , after turning up the laser beam which carried out outgoing radiation from LD71 by the half mirror 72. Therefore, the optical unit 70 will repeat and floodlight beam light to a radial. That is, information input area 3a will be formed of the beam light floodlighted by the radial from two optical units 70. It is reflected by the polygon mirror 73 and the beam light which it was reflected and carried out incidence to the optical unit 70 on the other hand reaches a half mirror 72. The reflective beam light which reached the half mirror 72 penetrates a half mirror 72, reaches a photo detector 75, and is changed into an electrical signal.

[0107] Next, coordinate input unit 3C which replaced with and applied such an optical unit 70 to the optical unit 27 used by 1st coordinate input unit 3A is explained. If the beam light by which the directions member P is inserted in a certain location in information input area 3a is covered as shown in drawing 13, since it is not reflected by the recurrence reflective member 28, the beam light will not reach a photo detector 75. Thus, when the beam light by which the directions member P is inserted in a

certain location in information input area 3a is covered, a DIP appears in the configuration of the luminous-intensity distribution from a photo detector 75.

[0108] Although optical reinforcement shows " $I=I_1$ " when the directions member P is not inserted in information input area 3a as it is shown in drawing 14, although detailed explanation is omitted since it is technically well-known about the electrical installation of each part, as for optical reinforcement, " $I=I_0$ " will be shown, when the directions member P is inserted in information input area 3a and recursive light does not return to a photo detector 75. Thus, the part whose optical reinforcement is " $I=I_0$ " is a DIP. In addition, among drawing 14, time amount  $t=t_0$  is the criteria location of rotation of the polygon mirror 73, and is a time of the beam light by which a rotation scan is carried out reaching a predetermined include angle.

[0109] Therefore, in the time amount t from which optical reinforcement became " $I=I_0$ ", if it is  $t_1$ , the outgoing radiation include angle theta of the beam light covered by the directions member P inserted in information input area 3a is computed as  $\theta = \omega(t_1 - t_0) = \omega \cdot t$ . That is, the outgoing radiation include angle theta ( $\theta_{tanL}$ ,  $\theta_{tanR}$ ) of the beam light covered by the directions member P inserted in information input area 3a in the optical unit 70 (70L, 70R) prepared in each right and left is computed. The position coordinate (x y) which inserted the directions member P by the technique of triangulation based on those outgoing radiation include angles theta ( $\theta_{tanL}$ ,  $\theta_{tanR}$ ) will be computed.

[0110] Thus, the position coordinate (x y) of the computed directions member P will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.

[0111] And according to such coordinate input unit 3C, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparence, and high drawing.

[0112] D. Explain the 4th coordinate input unit, next 4th coordinate input unit 3D based on drawing 15 - drawing 16. In addition, about the same part as the part explained by 2nd coordinate input unit 3B and 3rd coordinate input unit 3C, explanation is also omitted using the same sign.

[0113] This 4th coordinate input unit 3D is the modification of the optical unit in 2nd coordinate input unit 3B. Although the sector-like flux of light film was floodlighted in the detail in the optical unit 27 used by 2nd coordinate input unit 3B and the information input area was formed in it, in 4th coordinate input unit 3D, it has rotation scan systems, such as a polygon mirror, and the optical unit 70 which floodlights to a radial the light beam in which outgoing radiation was carried out by the rotation scan system from the light source, and forms an information input area is used. In addition, since 3rd coordinate input unit 3C explained, the explanation about the optical unit 70 is omitted here.

[0114] Coordinate input unit 3D which replaced with and applied such an optical unit 70 to the optical unit 27 used by 2nd coordinate input unit 3B is explained. As shown in drawing 15, when the directions member 61 is inserted in a certain location in information input area 3a, retroreflection of the predetermined beam light is carried out in the recurrence reflective member 62 of the directions member 61, and the beam light reaches a photo detector 75. Thus, when retroreflection of the beam light by which the directions member 61 is inserted in a certain location in information input area 3a is carried out, a peak appears in the configuration of the luminous-intensity distribution from a photo detector 75.

[0115] Although optical reinforcement shows " $I=I_0$ " when the directions member 61 is not inserted in information input area 3a as it is shown in drawing 16, although detailed explanation is omitted since it is technically well-known about the electrical installation of each part, as for optical reinforcement, " $I=I_1$ " will be shown, when the directions member 61 is inserted in information input area 3a and recursive light reaches a photo detector 75. Thus, the part whose optical reinforcement is " $I=I_1$ " is a peak. In addition, among drawing 16, time amount  $t=t_0$  is the criteria location of rotation of the polygon mirror 73, and is a time of the beam light by which a rotation scan is carried out reaching a predetermined include angle.

[0116] Therefore, in the time amount t from which optical reinforcement became " $I=I_1$ ", if it is  $t_1$ , the outgoing radiation include angle theta of the beam light in which retroreflection was carried out by the directions member 61 inserted in the information input area 63 is computed as  $\theta = \omega(t_1 - t_0) = \omega \cdot t$ . That is, the outgoing radiation include angle theta ( $\theta_{tanL}$ ,  $\theta_{tanR}$ ) of the beam light in



which retroreflection was carried out by the directions member 61 inserted in information input area 3a in the optical unit 70 (70L, 70R) prepared in each right and left is computed. The position coordinate (x y) which inserted the directions member 61 by the technique of triangulation based on those outgoing radiation include angles theta (thetanL, thetanR) will be computed.

[0117] Thus, the position coordinate (x y) of the computed directions member 61 will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.

[0118] And according to such coordinate input unit 3D, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparence, and high drawing.

[0119] E. Explain the 5th coordinate input unit, next coordinate input unit of \*\* 5th 3E based on drawing 17 - drawing 18. This 5th coordinate input unit 3E is the so-called coordinate input unit of the camera image pick-up method which incorporates the image information in an information input area with an image pick-up camera, and detects a position coordinate based on the part of that incorporated image information.

[0120] Here, drawing 17 is the front view showing roughly the configuration of 5th coordinate input unit 3E. The image pick-up camera 82 which is an image pick-up means separates distance w in the upper part both ends of information input area 3a in 5th coordinate input unit 3E, and is formed in them. The photo detector 83 and the image formation optical lens 84 which are CCD (Charge Coupled Device) separate distance f to the image pick-up camera 82, and are prepared in it. The image pick-up field angle of these image pick-up cameras 82 is about 90 degrees, and it is installed, respectively so that information input area 3a may be made into photographic coverage. Moreover, the image pick-up camera 82 is installed so that it may become a predetermined distance from screen 2a of PDP2 which forms a coordinate input screen, and the optical axis is parallel to screen 2a of PDP2.

[0121] In addition, it is the periphery section except the upper part of information input area 3a, and the whole photography visual field is prepared in the background plate 85 in the wrap location, without barring the image pick-up field angle of the image pick-up camera 82. This background plate 85 turns that field in the center of information input area 3a, and is formed in an abbreviation perpendicular to screen 2a of PDP2. Let this background plate 85 be uniform black, for example.

[0122] The signal of the image pick-up camera 82 and relation with the directions member P are shown in drawing 18. As shown in drawing 18, when the directions member P is inserted in information input area 3a, the directions member P is photoed by the image pick-up camera 82, and the image of the directions member P is formed on the photo detector 83 of the image pick-up camera 82. In the background plate 85 is black like 5th coordinate input unit 3E and using a finger as a directions member P, since the directions member P will have a high reflection factor compared with the background plate 85, the part equivalent to the directions member P of a photo detector 83 serves as a field (bright point) where optical reinforcement is strong.

[0123] Since it is technically well-known about the electrical installation of each part, detailed explanation is omitted, but as shown in drawing 18, when the directions member P is inserted in information input area 3a, a peak appears in the configuration of the luminous-intensity distribution from a photo detector 83. The location Dn where this peak appears supports include-angle thetan of the appearance of the directions member P from the principal point of the image formation optical lens 84, and thetan can express it as  $\text{thetan} = \arctan(Dn/f)$  as a function of Dn. That is, the position coordinate (x y) of the directions member P will be computed by the technique of triangulation based on the peak which appears in the wave of optical reinforcement like coordinate input unit 3A which mentioned above also in 5th coordinate input unit 3E of such a camera image pick-up method.

[0124] Thus, the position coordinate (x y) of the computed directions member P will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.

[0125] In addition, as a directions member P, the exclusive pen with a light emitting device with which self emits light is applicable.

[0126] And according to such 5th coordinate input unit 3E, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparence, and high drawing.

[0127] Then, the explanation is omitted about the processing currently performed by the conventional

information input/output system among the processings in the drawing software which is one of the various application programs 24 performed in the information input/output system 1 of the gestalt of this operation, and the same processing, and the function relevant to the features-function with which the information input/output system 1 is equipped is explained below.

[0128] As shown in drawing 19, in drawing software, the tool bars 91 and 92 which enable actuation of the various functions by the user are displayed. And if it points to the location where the icon 93 contained in these tool bars 91 and 92 is displayed with a finger etc., since the coordinate input unit 3 will detect the coordinate of that location and it will click on an icon 93, various actuation is attained.

[0129] Screen 2a is a big screen, such as 40 inches or 50 inches. However, moreover, the tool bars 91 and 92 Since it displays on the upper and lower sides of screen 2a, or an edge on either side, usually, User M Compromise to the location where the desired icon 93 is displayed, or [ lengthening the limbs greatly one by one, in order to click on an icon 93 ] Or it is necessary to start specially, whenever it clicks on an icon 93, in sitting on a chair and operating it, and actuation is complicated.

[0130] So, in drawing software, various kinds of processings in which it explains below are performed, and operability is raised. That is, drawing software displays various actuation images on screen 2a corresponding to a user performing various actuation on screen 2a with a finger etc.

[0131] Here, an actuation image is a graphic form displayed on a screen, and when a user performs predetermined actuation with a finger etc. to that graphic form, it receives that a user performs various actuation (various actuation concerning drawing software at this example) to the information input/output system 1.

[0132] That is, a user detects the difference in the actuation performed on screen 2a using a finger etc., displays a different actuation image for the actuation of every on screen 2a, and receives various actuation from a user through the displayed actuation image.

[0133] Drawing 20 is an explained flow chart which takes lessons from this processing one example. As shown in drawing 20, when the coordinate input unit 3 detects having pointed to 2 on screen 2a, and Points Pa and Pb (referring to drawing 21) to coincidence with the finger etc. (Y of step S1), Or the coordinate input unit 3 detects having pointed to 1 on screen 2a, and Point Pa (Y of step S2). With the condition of having pointed within fixed time amount T set up beforehand after this detection to (N of step S3), and Point Pa (referring to drawing 21), When the coordinate input unit 3 detects what coincidence pointed to other points Pb (refer to drawing 21), (Y of step S4), The distance of the coordinate location of the Point Pa and Point Pb which were detected is computed (step S5). When the distance is below the distance d set up beforehand, (Y of step S6), The icon 94 (refer to drawing 22) as an example of the actuation image contained in the drawing software beforehand stored in the hard disk 1 among the various icons 93 currently used with this drawing software is displayed on the predetermined field to which it is beforehand set up near the point Pb (step S7). Step S7 has realized an actuation image display means and actuation image display processing. step S3 -- a time check -- a means and a time check -- processing, the 1st comparison means, and 1st comparison processing are realized. Step S5 realizes a ranging means and ranging processing, and step S6 has realized the 2nd comparison means and 2nd comparison processing.

[0134] The example of drawing 22 shows the example which displays three, Rhine tool icon 94a, eraser icon 94b, and stamp icon 94c, on coincidence as an icon 94. If it points to the location where the icon 94 is displayed like the icon 94 if these icons 94 are displayed with a finger etc., since the coordinate input unit 3 will detect the coordinate of the location and it will click on an icon 94, various actuation is attained.

[0135] for example, the icon of the function in which Rhine tool icon 94a is the icon of the function which draws Rhine on screen 2a, and eraser icon 94b eliminates the image on screen 2a in the example of an icon 94 shown in drawing 22 -- it is -- stamp icon 94c -- "secrecy" -- it is the icon of the function which displays which "secret" alphabetic character and "secret" mark on screen 2a. If it explains more concretely, by clicking Rhine tool icon 94a, the coordinate input unit 3 can detect the locus which traced the screen 2a top with the finger etc., and Rhine can be displayed on the locus. Moreover, by clicking eraser icon 94b, the coordinate input unit 3 can detect the locus which traced the screen 2a top with the

finger etc., and the image on the locus can be eliminated. furthermore, the location directed with the finger on screen 2a etc. by clicking stamp icon 94c -- "secrecy" -- which "secret" alphabetic character and "secret" mark can be displayed.

[0136] Thus, since the predetermined icon 94 can be displayed on the location where it is beforehand set up near the point Pb by pointing to two points and Points Pa and Pb to coincidence with a finger etc. Compromise to the location where the desired icon 94 is displayed, or [ lengthening the limbs greatly one by one, in order that User M may click on an icon 94 ] or -- starting specially, whenever it clicks on an icon 94, in sitting on a chair and operating it \*\*\*\* -- etc. -- even if it does not perform troublesome actuation, an icon 94 can be displayed at hand and operability can be improved.

[0137] In order to display an icon 94, only when it points to two points of screen 2a to coincidence with a finger etc., (Y of step S1, Y of S2, Y of S4), The case where the locus traced with the finger etc. by the function of Rhine tool icon 94a is indicated by Rhine since an icon 94 is displayed (step S7), It is easily distinguished from the case where it points to one on screen 2a, like [ in the case of eliminating the image on the locus traced with the finger etc. by the function of eraser icon 94b ].

[0138] Moreover, if a certain amount of time amount is vacated and it is made to point to two on screen 2a, since an icon 94 is displayed, the case where place the extent time difference which is the purpose of an except, and it points to two points is distinguishable, since it is necessary to point to two points and Points Pa and Pb within fixed time amount T at coincidence (N of step S3).

[0139] Furthermore, if distance d is set as the distance usually considered that it may point with two fingers of one hand, since an icon 94 is displayed, the case where keep the extent distance which is the purpose of an except and it points to two points is distinguishable, since an icon 94 is not displayed unless the distance during Points Pa and Pb is below the distance d (Y of step S6).

[0140] In addition, the class of icon displayed as an icon 94 and a number, a display position (the exception of the location on the basis of any of Points Pa and Pb, Point Pa or the distance from Pb, a direction, range), etc. can be beforehand set up on the actuation screen displayed on screen 2a. This realizes a reception means and reception processing. And if this setup is made, the contents of the aforementioned predetermined table will be updated in the class of icon 94 after a setup and a number, and a display position, and an icon 94 will be henceforth displayed according to those contents. This realizes an updating means and an update process.

[0141] In this case, these items can also be registered into a table for every user according to individual. And discernment of each user can be performed using various authentication techniques. For example, or it inputs a user's name and ID on screen 2a (or it chooses), it is reading a user's fingerprint and collating this with a registered fingerprint beforehand etc. (for details, see a JP,2000-187419,A official report, the JP,2000-187420,A official report, etc., for example). Furthermore, when Points Pa and Pb are in the upper limit side on screen 2a, an icon 94 is displayed on the bottom, when it is in a lower limit side at the bottom, and when Points Pa and Pb are in the right end side on screen 2a, an icon 94 can be displayed on left-hand side on right-hand side, when it is in a left end side.

[0142] When it points to three or more on screen 2a, you may make it display an icon 94, although he is trying to display an icon 94 in the aforementioned example when it points to two points of Points Pa and Pb on screen 2a. In this case, you may make it change the class of icon 94 to display by to what point it pointed. By this, when it points to two points for example, on screen 2a, the highest icon 94 of operating frequency is displayed for a user. it is alike, and since it follows, the thing whose it increases with three points and four points and for which the icon 94 with low operating frequency is displayed one by one becomes possible, the class of icon 94 which carries out a finger and comes out of and which can be displayed is increased and the display can be changed easily, operability can be raised further.

[0143] By the way, in order to perform such processing, it is necessary to enable it to detect to coincidence the coordinate of two points (points Pa and Pb) to which it pointed on screen 2a. Then, the technique for detecting the coordinate of Points Pa and Pb to coincidence is also explained using the coordinate input unit 3 mentioned above.

[0144] That is, when coordinate input unit 3A of a recursive light electric shielding method was explained to the example and the directions members A and B are inserted into information input area 3a



at coincidence as shown in drawing 23, the field (scotoma) where the optical reinforcement of two places is weak is because it is generated, respectively on CCD (photo detector)39 of the optical unit 27 (left-hand side optical unit 27L, right-hand side optical unit 27R). that is, since the position coordinate was computed as a function of  $X_n L X_n R$  as mentioned above, when two directions members A and B are inserted into information input area 3a at coincidence While the include angle  $\theta_{R2}$  of an include angle  $\theta_{R1}$ , and the directions member B and right-hand side optical unit 27R of the directions member A and right-hand side optical unit 27R to make to make is computed The include angle  $\theta_{L2}$  of an include angle  $\theta_{L1}$ , and the directions member B and left-hand side optical unit 27L of the directions member A and left-hand side optical unit 27L to make to make will be computed, and a total of four position coordinates will be computed.

[0145] However, even if it is the case where a total of four position coordinates are computed by two directions members in this way by the inside of information input area 3a having been directed to coincidence, it is possible to detect the position coordinate directed by two directions members. Real-image judging processing in which the position coordinate of the actual covering point (reflective spot) by two or more directions members is judged out of two or more position coordinates computed below is explained.

[0146] The flow chart which shows roughly the flow of the processing in which drawing 24 includes real-image judging processing here, and drawing 25 are the explanatory views showing the condition that two or more position coordinates which can be set to information input unit 3A are computed. In addition, in drawing 21, the coordinate locus of a real image which directed "A1, A2, A3, A4" by one directions member, and "B1, B-2, B3, B4" show the coordinate locus of the real image directed by the directions member of another side. Moreover, "C1, C2, C3, C4", and "D1, D2, D3, D4" are virtual images.

[0147] In the gestalt of this operation, calculation of a coordinate judges first whether a calculation coordinate is five or more (step S14 shown in drawing 24). Since directions members, such as (Y of step S14 shown in drawing 24), three or more fingers, and a pen, are inserted into information input area 3a at coincidence when a calculation coordinate is five or more, future decision is not performed.

[0148] On the other hand, when a calculation coordinate is not five or more, in continuing step S15, it is judged from the directions member inserted into (N of step S14 shown in drawing 24) information input area 3a being one or two whether the number of calculation coordinates is one.

[0149] For example, since the number of calculation coordinates is not one when two directions members are inserted into information input area 3a at coincidence and four position coordinates (A1, B1, C1, D1 which are shown in drawing 25) are computed (N of step S15), coordinate extract processing in which the position coordinate of the actual covering point by two or more directions members is extracted out of two or more position coordinates is performed. In addition, although not illustrated especially, when 1 receives optical unit 27 when two directions members are inserted into information input area 3a at coincidence and the insertion point is located in a line on a straight line, the number of the position coordinates computed is two.

[0150] As coordinate extract processing, two or more computed position coordinates (A1, B1, C1, D1) are first memorized in the memory of RAM14 grade (step S16).

[0151] In continuing step S17, it is judged whether there is any position coordinate decided as a real image among two or more position coordinates (A1, B1, C1, D1) recorded on memory.

[0152] When there is no position coordinate decided as a real image, it progresses to (N of step S17), and step S18, and it judges whether the calculation coordinate required for a real-image judging for multiple times acquired one by one serially is memorized by memory.

[0153] When the calculation coordinate for multiple times is memorized by memory, after setting up the initial criteria (experimental value) of (Y of step S18) vector length, displacement length, and the displacement direction (step S19), it progresses to step S20 and real-image judging processing is performed.

[0154] Here, drawing 26 is a flow chart which shows the flow of real-image judging processing roughly. As shown in drawing 26, first, in step S51, real-image judging processing makes a predetermined

calculation coordinate an origin coordinate, computes the coordinate vector value and coordinate vector length between coordinates, and memorizes them in the memory of RAM14 grade for every sampled position coordinate.

[0155] Here, the calculation approach of a coordinate vector value is explained with reference to drawing 27. In drawing 27, the position coordinate which was able to acquire the position coordinate detected last time (X1, Y1), and this time is set to (X2, Y2). A coordinate vector value is computed by  $\Delta Y/\Delta X$  from variation  $\Delta X=X2-X1$  of the direction of X coordinate, and variation  $\Delta Y=Y2-Y1$  of the direction of Y coordinate. From X shaft orientations, the coordinate vector value in this case is evaluated at intervals of 10 degrees by the vector table TB stored in RAM42 shown in drawing 28, and is beforehand stored in it. In addition, what is necessary is just to set this spacing (10 degrees) as arbitration. Moreover, the approximate value of a calculation result shall be used for a coordinate vector value. For example, it will be set to coordinate vector value =24 if it is the case of  $\Delta Y/\Delta X=0.900$  in  $-\Delta Y$  and  $-\Delta X$ .

[0156] Moreover, if the coordinate vector value between the coordinates in each sampling is computed as mentioned above as drawing 27 is shown, and the coordinate vector length L between each coordinate is a coordinate (X1, Y1) and the coordinate vector length L1 of a between (X2, Y2), it is  $L1=\sqrt{(Y2-Y1)^2+(X2-X1)^2}$ .

It is alike and is computed more. Thus, the coordinate vector value and its coordinate vector length are computed for every sampled position coordinate, respectively.

[0157] That is, in step S51, processing formed into a vector coordinate using the vector data by which setting storing is carried out beforehand to a vector table TB about the length which indicates a part for the change to be the direction where it changes between the position coordinates acquired one by one serially is performed.

[0158] Then, it progresses to step S52 and it is judged whether the coordinate vector length which computed at step S51 is unusual coordinate vector length (abnormality vector length) which cannot move in a coordinate detection period (predetermined time interval accompanying a sampling signal). In addition, the coordinate detection period in the gestalt of this operation is set to 20ms. That is, since step S52 cannot be moved in fact when the coordinate vector length which computed at step S51 is longer than the die length detected in a coordinate detection period (20ms), the coordinate locus judges it to be what is unusual coordinate vector length (abnormality vector length), and is not a real-image locus.

[0159] When coordinate vector length is abnormality vector length, (Y of step S52), Progress to step S53 and it is judged whether the number of position coordinates as which the number of the coordinate vector length which judged abnormality vector length was detected was reached. If the detected number of position coordinates is not reached (N of step S53), a terminal position coordinate is changed (step S54), and the coordinate vector value based on the terminal point and coordinate vector length are again computed in step S51.

[0160] That is, processing of steps S51-S52 is repeated until it is judged with coordinate vector length not being abnormality vector length (N of step S52), or until it is judged with the coordinate vector length about the position coordinate of all terminal points being abnormality vector length (Y of step S53).

[0161] If the case where followed, for example, a position coordinate A1 is made into an origin coordinate is explained The position coordinate computed just behind that as shown in drawing 25 from it being A2, B-2, and C2 and D2 One position coordinate is chosen at a time as a terminal point from these position coordinates (A2, B-2, C2, D2). Sequential calculation of any of A1 ->A2, A1 ->B-2, A1 ->C2, and A1 ->D2, the coordinate vector value (origin vector value) concerning one, and its coordinate vector length (origin vector length) will be carried out, and the sequential judging of whether it is a real-image locus will be carried out.

[0162] In addition, since (Y of step S53) and decision of a real image can be performed when judged with the coordinate vector length about the position coordinate of all terminal points being abnormality vector length, it progresses to step S21 mentioned later.

[0163] On the other hand, when judged with coordinate vector length not being abnormality vector

length, (N of step S52) and the position coordinate of the terminal point are memorized in the memory of RAM14 grade (step S55), and predetermined initialization ( $n=3$  ( $n$ : count of a coordinate detection period)) is performed (step S56).

[0164] In continuing step S57, the position coordinate of the terminal point of the origin vector memorized in memory in step S55 is made into an origin coordinate, the coordinate vector value and coordinate vector length between coordinates with the position coordinate detected in the  $n$ -th coordinate detection period are computed, and it memorizes in the memory of RAM14 grade.

[0165] Then, it progresses to step S58 and the coordinate vector length which computed at step S57 judges whether it is the unusual coordinate vector length (abnormality vector length) which cannot move in a coordinate detection period.

[0166] When judged with coordinate vector length not being abnormality vector length, (N of step S58), It progresses to step S59 and the coordinate locus of  $A1 \rightarrow A2$  and the coordinate locus of  $A2 \rightarrow A3$  which should be a real-image locus are compared, a coordinate vector value is in the specific amount of displacement (V), and coordinate vector length judges whether it is the locus (abnormalities a variation rate merit) which is outside the specific amount of displacement (L).

[0167] Thus, a coordinate vector value being in the specific amount of displacement (V), and judging whether it is the locus (abnormalities a variation rate merit) which is outside the amount of displacement of specification [ coordinate vector length ] (L) As shown in drawing 29 , in drawing a straight line generally Although a coordinate vector value changes when drawing a curve, although the coordinate vector length within a coordinate vector value and the same time amount is almost the same and not being illustrated especially, variation is abbreviation identitas and originates in coordinate vector length serving as abbreviation identitas. That is, when a detection object moves onto a straight line or a curve, since it is not generated, the big difference to coordinate vector length and a coordinate vector value is eliminated about the locus (abnormalities a variation rate merit) which is outside the amount of displacement of specification [ coordinate vector length ] (L), even if a coordinate vector value is in the specific amount of displacement (V).

[0168] abnormalities -- a variation rate -- the coordinate locus of  $A1 \rightarrow A2$  and the coordinate locus of  $A2 \rightarrow A3$  which it should progress to (N of step S59), and step S60, and should be a real-image locus when judged with his not being merit -- comparing -- the variation rate of specification [ a coordinate vector value ] -- it judges whether it is the locus (abnormalities a variation rate direction) on which it is out of an amount (V), and coordinate vector length is decreasing.

[0169] Thus, judging whether it is the locus (abnormalities a variation rate direction) on which a coordinate vector value is out of the specific amount of displacement (V), and coordinate vector length is decreasing As shown in drawing 30 , in changing the direction of a straight line a lot and drawing it generally Since the writing speed to turn will carry out sequential reduction, will be in a idle state in the direction commutation point and will begin to be again drawn in the conversion direction at the rate of usual, when a coordinate vector value changes a lot, coordinate vector length originates in increasing toward the conversion direction, after decreasing serially. That is, when a detection object changes a direction a lot, since a idle state of operation occurs just before, even if coordinate vector length is decreasing, it eliminates about the locus (abnormalities a variation rate direction) whose coordinate vector value is outside the specific amount of displacement (V).

[0170] abnormalities -- a variation rate -- if it puts in another way when judged with it not being a direction (N of step S60) -- abnormality vector length -- abnormalities -- a variation rate -- merit -- abnormalities -- a variation rate -- the case where it is not a direction, either -- the position coordinate of the terminal point -- the memory of RAM14 grade -- memorizing (step S61) -- the count  $n$  of a coordinate detection period -- "1" -- it increments (step S62).

[0171] Then, it is judged whether in step S63, the number of the calculation coordinates for multiple times (judgment coordinate number) which needs the count  $n$  of a coordinate detection period for the real-image judging memorized by memory and which is obtained one by one serially was exceeded. When the count  $n$  of a coordinate detection period is not over the judgment coordinate number, (Y of step S63) and the continuation vector mentioned above are made into an origin vector (step S64), and in

step S57, the coordinate vector value based on the terminal point and coordinate vector length are computed again.

[0172] That is, a terminal position coordinate is changed (step S66), and processing of steps S57-S64 is repeated until the position coordinate of all terminal points is judged with their being abnormality vector length, abnormality displacement length, or the abnormality displacement direction (Y of step S65).

[0173] and -- the position coordinate of all terminal points -- abnormality vector length or abnormalities -- a variation rate -- merit or abnormalities -- a variation rate -- when judged with it being a direction, (Y of step S65), the coordinate vector value based on [ in / progress to step S54 again, change a terminal position coordinate, and / step S51 ] the terminal point, and coordinate vector length are computed.

[0174] The position coordinate of the terminal point of the origin vector which followed, for example, was memorized in memory in step S55 is A2. When A1 ->A2 shall be a real-image locus, the position coordinate computed just behind that as shown in drawing 25 from it being A3, and B3, C3 and D3 One position coordinate is chosen at a time as a terminal point from these position coordinates (A2, B-2, C2, D2). Sequential calculation of any of A2 ->A3, A2 ->B3, A2 ->C3, and A2 ->D3, the coordinate vector value (continuation vector value) concerning one, and its coordinate vector length (continuation vector length) will be carried out, and the sequential judging of whether it is a real-image locus will be carried out.

[0175] Since it means that (Y of step S63) and a real image were decided on the other hand when judged with the count n of a coordinate detection period having exceeded the judgment coordinate number, the position coordinate will be transmitted to a computer 5 through an interface 43 (step S67), and it will use for processing of the display of the directions location by the directions member, the command input corresponding to a directions location, etc.

[0176] Here, the judgment of being a real image about other position coordinates based on the position coordinate of 1 is explained with reference to drawing 23 . If each A and A' of the judgment of being a real image about other position coordinates based on the position coordinate of 1 shall be a real image in drawing 23 , a coordinate will be detected in the direction of \*\*. For this reason, it turns out that either of A and A' is a real image. Moreover, it turns out similarly that either of B and B' is a real image. That is, only either of the position coordinate which exists in the same direction is a real image, and another side will be a virtual image. Moreover, since B' of the \*\* direction will also be recognized as a virtual image while A' of another side is recognized as a virtual image when it turns out that one A is a real image, it turns out that B is a real image. That is, if a real image or a virtual image is recognized about the position coordinate of one among four position coordinates memorized by memory, it turns out that the judgment of the real image about all position coordinates or a virtual image is possible. Therefore, since it is necessary to perform a real-image judging about no computed position coordinates, it becomes possible to detect the position coordinate at the time of directing two or more places to coincidence by low cost.

[0177] In addition, as shown in drawing 31 , when the position coordinate (it sets to drawing 31 and is B1) of one exists out of information input area 3a among two or more position coordinates (A1, B1, C1, D1) memorized by memory, A1 and C1 can be decided as a real image.

[0178] That is, if a real image or a virtual image is recognized about the position coordinate of one among four position coordinates memorized by memory, according to the judgment of the real image about all position coordinates or a virtual image being possible, it will decide as a real image (step S68), and the position coordinate of another side will also be transmitted to a computer 5 through an interface 43 (step S69). Moreover, processing of steps S67-S69 is repeated until it decides about all judgment coordinate numbers (Y of step S70). And when transmission of the position coordinate of the real image about all judgment coordinate numbers is completed, it ends and (Y of step S70) and real-image judging processing return to step S14.

[0179] Next, the processing at the time of being judged with the coordinate vector length about the position coordinate of all terminal points being abnormality vector length in step S53 is explained. Although it progresses to step S21 as (Y of step S53), and a thing which cannot perform decision of a real image as mentioned above when judged with the coordinate vector length about the position

coordinate of all terminal points being abnormality vector length, in this step S21, it judges whether there is any paddle which is still performing real-image judging processing about the position coordinate (for example, C1 [ on drawing 25 and as opposed to A1 ]) of the same direction. When real-image judging processing about the position coordinate of the same direction has not been performed yet, (N of step S21) and an origin coordinate are changed (step S22), and it progresses to step S20 again, and real-image judging processing is performed. On the other hand, when real-image judging processing about the position coordinate of the same direction is being performed, (Y of step S21) and the criteria of the vector length, displacement length, and the displacement direction set up at step S19 are changed (step S23), it progresses to step S20 again, and real-image judging processing is performed. That is, a real-image judging will be repeated on these conditions by turns about the position coordinate of two points of the same direction.

[0180] Moreover, when the number of the computed position coordinates is one, while transmitting (Y of step S15), and its computed position coordinate to a computer 5 through an interface 43 (step S24), it memorizes in the memory of RAM14 grade (step S25), and returns to step S14.

[0181] Next, in step S17, the case where it is judged with there being a position coordinate decided as a real image is explained. When there is a position coordinate decided as a real image, it progresses to (Y of step S17), and step S26.

[0182] The case where there is a position coordinate decided as a real image here is a case where two or more storage of the position coordinate in case the position coordinate computed as mentioned above is not plurality is carried out at the memory of RAM14 grade, for example, is a case as shown in drawing 32 . As the directions member of 1 has described drawing 32 , it shows the condition that other directions members were inserted into information input area 3a. In addition, the case where there is a position coordinate decided as a real image cannot be overemphasized by including the case where the coordinate of two points is decided by processing which was mentioned above.

[0183] In step S26, based on the last time of the position coordinate decided as a real image, and the value before last, the coordinate vector value (real-image vector value) and coordinate vector length (real-image vector length) between coordinates are computed, and it memorizes in the memory of RAM14 grade.

[0184] then, vector length and a variation rate -- merit and a variation rate -- after setting up the initial criteria (experimental value) of a direction (step S27), the position coordinate of the terminal point of the real-image vector memorized in memory in step S26 is made into an origin coordinate, the coordinate vector value and coordinate vector length between coordinates with the position coordinate detected by coincidence are computed, and it memorizes in the memory of RAM14 grade. [ two or more ]

[0185] Then, it progresses to step S29 and the coordinate vector length which computed at step S28 judges whether it is the unusual coordinate vector length (abnormality vector length) which cannot move in a coordinate detection period.

[0186] When judged with coordinate vector length not being abnormality vector length, (N of step S29), It progresses to step S30 and the coordinate locus of A3->A4 and the coordinate locus of for example, A4->A which should be a real-image locus are compared, a coordinate vector value is in the specific amount of displacement (V), and coordinate vector length judges whether it is the locus (abnormalities a variation rate merit) which is outside the specific amount of displacement (L).

[0187] abnormalities -- a variation rate -- the coordinate locus of A3->A4 and the coordinate locus of for example, A4->A which it should progress to (N of step S30), and step S31, and should be a real-image locus when judged with his not being merit -- comparing -- the variation rate of specification [ a coordinate vector value ] -- it judges whether it is the locus (abnormalities a variation rate direction) on which it is out of an amount (V), and coordinate vector length is decreasing.

[0188] abnormalities -- a variation rate -- if it puts in another way when judged with it not being a direction (N of step S31) -- abnormality vector length -- abnormalities -- a variation rate -- merit -- abnormalities -- a variation rate, in not being a direction, either The position coordinate of the terminal point is memorized in the memory of RAM14 grade (step S32). While transmitting the position coordinate to a computer 5 through an interface 43 (step S33), it decides as a real image (step S34), and



the position coordinate of another side is also transmitted to a computer 5 through an interface 43 (step S35).

[0189] the case (Y of step S29) where it is judged with coordinate vector length being abnormality vector length on the other hand -- abnormalities -- a variation rate -- the case (Y of step S30) where it is judged with his being merit -- abnormalities -- a variation rate -- a detection coordinate is changed (step S37) and processing of steps S28-S31 is repeated until it reaches (Y of step S31), and a detection coordinate number (Y of step S36), when judged with it being a direction.

[0190] Therefore, when [ for example, ] the position coordinate of the terminal point of the real-image vector memorized in memory in step S26 is A4, The position coordinate computed just behind that as shown in drawing 32 from their being A, B, C, and D One position coordinate is chosen at a time as a terminal point from these position coordinates (A, B, C, D). Sequential calculation of A4->A, A4->B, A4->C, any of A4->D or the coordinate vector value (locus vector value) concerning one, and its coordinate vector length (locus vector length) will be carried out, and the sequential judging of whether it is a real-image locus will be carried out. That is, other position coordinates located in the same direction to a photo detector in pursuing the locus of the position coordinate of 1 judged that is a real image are recognized to be a virtual image, and the position coordinate which are other real images is decided.

[0191] Moreover, when a detection coordinate number is reached, (Y of step S36) and the criteria of the vector length, displacement length, and the displacement direction set up at step S27 are changed (step S38), and it progresses to step S28 again, and a coordinate vector value (locus vector value) and its coordinate vector length (locus vector length) are computed.

[0192] Even if it is the case where a total of four position coordinates are computed by two directions members by the above processings by the inside of information input area 3a having been directed to coincidence, the position coordinate directed by two directions members can be detected, and these two position coordinates can be confirmed.

[0193] Next, another example of the actuation image displayed on screen 2a is explained.

[0194] First, as shown in drawing 33 , when it points to coincidence to three on screen 2a, the dial 101 which is an actuation image is displayed on the location where it is beforehand set up near [ the ] the three points ( drawing 33 (a)). The image of this dial 101 is beforehand contained in the drawing software of a hard disk 17. And the location of three points which is pointing on screen 2a is moved, if actuation of turning a dial 101 is carried out, the image of a dial 101 can also be rotated and rotation actuation of the dial 101 can be carried out ( drawing 33 (b)). This dial 101 is carrying out rotation actuation, and makes it possible to perform predetermined actuation to the information input/output system 1. It is suitable for gradual or stepless adjustment of fixed physical quantity, such as adjustment of the voice volume in the case of outputting voice with the information input/output system 1 in this example, since an actuation image is a dial, etc.

[0195] Processing about this dial 101 is specifically performed as follows. Drawing 34 is a flow chart explaining the processing in this case. First, it detects that coincidence points to three on screen 2a (Y of step S71). Although the coordinate of three or more points to which it pointed on screen 2a is undetectable to coincidence in the processing explained below with reference to drawing 23 , it cannot be necessary to specify that exact coordinate of three points in this example that what is necessary is just to be able to detect that coincidence points to three on screen 2a. That is, since a total of nine points of the real image of three points and the virtual image of six points are detected also in the example below drawing 23 when pointing to three on screen 2a, thereby, it is detectable that actually pointing is three points (even if the exact location of three points is undetectable).

[0196] In the example of drawing 35 , 6 point G1-G6 of three-point Pa of a real image, Pb and Pc, and a virtual image are detected. And the coordinate of the middle point C of each of these coordinates Pa (xa, ya), Pb (xb, yb), Pc (xc, yc), G1 (x1, y1)-G6 (x6, y6) of nine points is searched for (step S72).

[0197] namely, --  $x0 = (xa + xb + xc + x1 + x2 + x3 + x4 + x5 + x6) / 9$   $y0 = (ya + yb + yc + y1 + y2 + y3 + y4 + y5 + y6) / 9$  .... (6)

\*\*\*\*\* is performed and the coordinate (x0, y0) of the middle point C is searched for.

[0198] And the image of a dial 101 is displayed centering on the location of this middle point C ( $x_0, y_0$ ) (step S73).

[0199] And when there is migration of a location, as it is shown in (Y of step S74), and drawing 36 nine-point Pa-Pc and in G1-G6 One point is specified as an observing point nine-point Pa-Pc and in G1-G6 (this example the point Pa), and the nearest detecting point is made into the moving point of an observing point at an observing point in the case of migration of a location (in this example, it displays as point Pa'). The middle point C as a core of a circle Angle-of-rotation  $\theta_{tam}$  of the circle concerned is computed from the observing point Pa ( $x_a, y_a$ ) and two points of moving point Pa' ( $x_{a'}, y_{a'}$ ) (step S75). Step S74 has realized a migration detection means and migration detection processing.

[0200] That is, migration length  $L = \sqrt{(x_{a'} - x_a)^2 + (y_{a'} - y_a)^2}$  radius  $r = \sqrt{(x_a - x_0)^2 + (y_a - y_0)^2}$  are calculated (also see drawing 37), and it is angle-of-rotation  $\theta_{tam} = (360 \times L) / (2 \times \text{pixr})$  from this result. (However, pi circular constant)

\*\*\*\*\*.

[0201] And according to angle-of-rotation  $\theta_{tam}$ , the image of a dial 101 is rotated and displayed centering on the middle point C (step S76). Steps S73, S75, and S76 have realized an actuation image display means and actuation image display processing. Moreover, actuation according to angle-of-rotation  $\theta_{tam}$  is received and performed (step S77). Step S77 has realized an actuation means and actuation processing. That is, when a dial 101 operates voice volume as mentioned above, voice volume will be operated according to the magnitude of angle-of-rotation  $\theta_{tam}$ . When no longer pointing to three on screen 2a, (Y of step S78) and the display of a dial 101 are eliminated (step S79).

[0202] Another example of the actuation image displayed on screen 2a is explained.

[0203] As shown in drawing 38, when it points to coincidence to five on screen 2a with five fingers of one hand etc., a door 102 is displayed on the location where it is beforehand set up near [ the ] the five points ( drawing 38 (a)). And if the location of five points to which it pointed as it was is moved below (or upper part), a door 102 will open gradually with migration of the location of five points, and the pallet 103 which is an actuation image will appear under a door 102 ( drawing 38 (b)). The image of a door 102 and a pallet 103 is beforehand contained in the drawing software of a hard disk 17. And various actuation can be inputted on a pallet 103 by pointing to one point from which a user differs on a pallet 103, respectively one by one. Since a door 102 is displayed and the pallet 103 which is an actuation image is first displayed on the bottom of a door 102 after that in this example, it is suitable when displaying the actuation image for performing the actuation image which you want to display immediately only by pointing to a screen 2a top, for example, the input which changes a initial value.

[0204] Processing about this pallet 103 is specifically performed as follows. Drawing 39 is a flow chart explaining the processing in this case. First, it detects that coincidence points to five on screen 2a (Y of step S81). Since a total of 25 points of the real image of five points and the virtual image of 20 points are detected when it cannot be necessary to specify the exact coordinate of five points and points to five on screen 2a also in this example, thereby, it is detectable that actually pointing is five points.

[0205] And the same operation as (6) is performed also here, and the coordinate ( $x_0, y_0$ ) of the middle point C of a total of 25 points is searched for (step S82). (refer to drawing 40) And the image of a door 102 is displayed on screen 2a centering on the middle point C (step S83). Step S83 has realized a door display means and door display processing.

[0206] Then, although (Y of step S84) and the location of the middle point C are also caudad moved when the location of five points to which the user is pointing is dragged caudad as it was and there is migration of the location of five points, it is not necessarily in agreement with the drag direction. Step S84 has realized a migration detection means and migration detection processing. Since the thing which is the need is the migration length to a lower part, if it sets the coordinate of C point after moving the coordinate of C point before migration ( $x_0, y_0$ ) to ( $x_1, y_1$ ) By " $l = y_1 - y_0$ ", the migration length  $l$  to a lower part is found (refer to drawing 41) (step S85), and the image of a door 102 is lowered and displayed only for the migration length  $l$  minutes, and a pallet 103 is displayed on the location of the first door 102 (step S86). Step S86 has realized a door modification means, door modification processing, an actuation image display means, and actuation image display processing. It is made for the

display of this pallet 103 to be whether a pallet 103 appears gradually from under a door 102 by displaying only the location of a door 102, and the image of a part with which it is not covered.

[0207] And when actuation of a pallet 103 is made, (Y of step S87) and its actuation (for example, as mentioned above modification of a initial value) are received and performed (step S88), and when termination of a display of a pallet 103 is directed on a pallet 103, the display of (Y of step S89), a door 102, and a pallet 103 is ended (step S90). Step S88 has realized an actuation means and actuation processing.

[0208] Another example of the actuation image displayed on screen 2a is explained.

[0209] As shown in drawing 42 , it is not simultaneous on screen 2a, and when it points to three points to coincidence one by one, the pallet 104 which is an actuation image is displayed on the location where it is beforehand set up near [ the ] the three points. The image of a pallet 104 is contained in the drawing software stored in the hard disk 17. In this case, a pallet 103 does not appear gradually with the drag of a door 102 like the above-mentioned example, but since a pallet 104 is what is displayed immediately, it is suitable for the display of the actuation image which you want to display immediately only by pointing to a screen 2a top.

[0210] As shown in drawing 43 , after the processing in this case detects one point (point A) (Y of step S91) (refer to drawing 44 ), One another point (point B) is detected in predetermined time, with this one point maintained (Y of step (refer to drawing 45 ) S92). Furthermore, if one point (point C) of an exception is detected, with these two points maintained (Y of step S93) (refer to drawing 46 ), a pallet 104 will be displayed on the location where it is beforehand set up near these three points (step S94). Step S94 has realized an actuation image display means and actuation image display processing.

[0211] In this case, since it can also perform easily detecting the exact coordinate of three points (points A, B, and C), you may make it determine the display position of a pallet 104 from that exact coordinate of three points, although it may ask for the middle point of the real image of three points, and the virtual image of six points like the above-mentioned and a pallet 104 may be displayed on the location of the predetermined direction of the middle point concerned, and predetermined distance.

[0212] That is, although Points A, B, C, and D will be detected if Point B is directed with the point A directed as shown in drawing 45 , it turns out from the beginning that an A point is a real image ( drawing 44 ). Since Points B and D should not be detected supposing Point C is the real image of the 2nd point, and Points B and C should not be detected supposing Point D is the real image of the 2nd point, a B point is judged to be the real image of the 2nd point. Next, since Points I, F, D, C, and E will not be detected if Point H is the real image of the 3rd point supposing Points A and B are decided as shown in drawing 46 , Point H is judged to be a virtual image. The same decision is repeated and it is judged with Points A, B, and C being real images.

[0213] After the display (step S94) of a pallet 104, when actuation of a pallet 104 is made, (Y of step S95) and its actuation (for example, as mentioned above modification of a initial value) are received and performed (step S96), and when termination of a display of a pallet 104 is directed on a pallet 104, (Y of step S97) and the display of a pallet 104 are ended (step S98).

[0214] Another example of the actuation image displayed on screen 2a is explained.

[0215] If it points to one point (point Pa) on screen 2a, it points to the 2nd (point Pb) point in this condition and this location of the 2nd point is moved up and down as shown in drawing 47 , the slider bar 105 which is an actuation image will be displayed on the location of the 2nd point to which it is pointing. The image of a slider bar 105 is contained in the drawing software in a hard disk 17. This slider bar 105 as well as the case of a dial 101 is suitable for gradual or stepless adjustment of fixed physical quantity, such as adjustment of the voice volume in the case of outputting voice with the information input/output system 1, etc.

[0216] As shown in drawing 48 , after the processing in this case detects one point (point A) (Y of step S101) (refer to drawing 49 ), One another point (point B) is detected in predetermined time, with this one point maintained (Y of step S102). Then, when migration of the 2nd (point B) point is detected with the first directions of one point (point A) maintained, it carries out by displaying the image of a slider bar 105 on (Y of step S103), and the location of the 2nd (point B) point (step S104). Step S103 realizes a



migration detection means and migration detection processing, and step S104 has realized an actuation image display means and actuation image display processing.

[0217] Detection of the exact coordinate location of Points A and B can be performed using the technique mentioned above with reference to drawing 23. Thereby, it can judge with Points A and B being real images among point A-D. and the time of the location of Point B moving -- the coordinate (refer to drawing 49 (x0, y0)) of the location of the original point B -- the coordinate of the location of the point B after migration --  $l$  (refer to drawing 50 (x1, y1)), if it carries out  $l = y1 - y0$ , since vertical migration length can be found, the image of a slider bar 105 can be displayed on the location which only distance  $l$  moved perpendicularly.

[0218] And actuation (adjustment of voice volume etc.) according to the distance  $l$  which moved is received and performed (step S105). Step S105 has realized an actuation means and actuation processing. Then, when detection of the two-point coincidence of Points A and B is no longer made, (Y of step S106) and the display of a slider bar 105 are eliminated (step S107).

[0219] In the above, the example of various actuation images was explained. Next, the processing for judging the exception of these actuation images and displaying a suitable actuation image according to the directions on screen 2a, is explained.

[0220] As shown in drawing 51, sequential detection of the two points is carried out on screen 2a (Y of step S111), when moving one point detected behind, it shifts to the processing described above with reference to (Y of step S112), and drawing 48 (step S113), and a slider bar 105 (refer to drawing 47) is displayed. In this case, when there is no migration of one point detected behind, it shifts to the processing described above with reference to (N of step S112), and drawing 20 (step S114), and an icon 94 (refer to drawing 22) is displayed.

[0221] Also when two points are detected to coincidence on screen 2a, it shifts to the processing described above with reference to (Y of step S115), and drawing 20 (step S114), and an icon 94 (refer to drawing 22) is displayed.

[0222] When sequential detection of the three points is carried out on screen 2a, it shifts to the processing described above with reference to (Y of step S116), and drawing 43 (step S117), and a pallet 104 is displayed (refer to drawing 42).

[0223] When three points are detected to coincidence on screen 2a, it shifts to the processing described above with reference to (Y of step S118), and drawing 34 (step S119), and a dial 101 is displayed (refer to drawing 33).

[0224] When five points are detected to coincidence on screen 2a, it shifts to the processing described above with reference to (Y of step S120), and drawing 39 (step S121), and a pallet 103 is displayed (refer to drawing 38). Processing of steps S111-S121 has realized an actuation image display means and actuation image display processing.

[0225] Below, the example of a display of other actuation images is explained briefly.

[0226] As shown in drawing 52, when it points to two points (points A and B) one by one on screen 2a So that the predetermined object 106 which is an actuation image is displayed, and the distance of these points A and B may be expanded and it may be made to reduce in those two points When moving the location of Points A and B, it responds to the magnitude of the migration length, and it expands and reduces and you may make it display the magnitude of an object 106. An object 106 is the icon 94 mentioned above.

[0227] Drawing 53 is a flow chart in this case. Namely, after detecting one point (point A) (Y of step S131), One another point (point B) is detected in predetermined time, with this one point maintained (Y of step S132). When Points A and B are moved, (Y of step S133) and an object 106 are displayed (step S134). Then, the distance  $la$  of the beginning of Point A and Point B, A difference with the distance  $lb$  after migration is searched for, the range difference  $lc$  of the distance  $la$  and distance  $lb$  is searched for (step S135), and it responds to the magnitude of the range difference  $lc$ , and an object 106 is expanded and it reduces (step S136). By step S133, S134 realizes an actuation image display means and actuation image display processing, and step S136 has realized an enlarging-or-contracting means and enlarging-or-contracting processing for a migration detection means and migration detection processing.

[0228] As shown in drawing 54 , when others and three points (points B, C, and D) are detected to coincidence, maintaining this detection of one point after detection of one point (point A), you may make it display a pallet 104, although he is trying to display a pallet 104 in the example mentioned above with reference to drawing 42 - drawing 46 when sequential detection of the points A, B, and C is carried out.

[0229] Furthermore, although a slider bar 105 is displayed on Point B and he is trying for a slider bar 105 to move with migration of Point B in the example mentioned above with reference to drawing 47 - drawing 50 , a slider bar 105 is displayed ranging over Points A and B, and you may make it a slider bar 105 move with vertical migration of Points A and B, as shown in drawing 55 .

[0230]

[Effect of the Invention] By easy actuation which points to two or more [ on a screen ] with the finger of one hand etc., since invention given in claims 1 and 12 can display a required actuation image near the location to which it pointed etc., it can operate an actuation image on a screen at hand immediately, and it can raise operability. And since there is no display of an actuation image in pointing to one on a screen, it is easily distinguishable from the actuation performed by pointing to one place.

[0231] In invention given in claims 1 and 12, since invention given in claims 2 and 13 does not display an actuation image when a certain amount of time interval is opened and it points one by one to two or more [ on a screen ], it can distinguish easily the case where it points to two or more [ on a screen ], without aiming at the display of an actuation image.

[0232] In invention according to claim 1, 2, 12, or 13, since invention given in claims 3 and 14 does not display an actuation image when a certain amount of distance spacing is opened and it points to two or more [ on a screen ], it can distinguish easily the case where it points to two or more [ on a screen ], without aiming at the display of an actuation image.

[0233] Invention of a publication can display an actuation image on claims 4 and 15 in the class, number, or display position beforehand registered into 1 of either [ claims 1-3 and ] 12-14 in invention of a publication.

[0234] Since invention given in claims 5 and 16 can be registered into a request of a user about the detail of the actuation image displayed on claims 4 and 15 in invention of a publication, it can raise operability further.

[0235] In invention given in claims 1 and 12, it points on a screen to invention given in claims 6 and 17, and a user can perform predetermined actuation by migration of a location.

[0236] It can be made to display that it pointed on the screen to invention given in claims 7 and 18, and it operated the actuation image in invention given in claims 6 and 17 according to migration of a location.

[0237] It can be made easy to set invention given in claims 8 and 19 to invention given in claims 1 and 12, to expand, to reduce to the size of a request of an actuation image easily, and to operate it.

[0238] Since invention given in claims 9 and 20 can display an actuation image from under the door which moves gradually if the location to which did not display an actuation image but it pointed is moved, when it points to two or more locations on a screen in invention of a publication to claims 1 and 12, and displaying an actuation image not to not much show immediately, it is suitable.

[0239] Invention of a publication can use an icon, a dial, a slider bar, or a pallet for 1 of either [ claims 1-9 and ] 12-20 as an actuation image in invention of a publication at claims 10 and 21.

[0240] Invention of a publication can make claims 11 and 22 display various kinds of actuation images on 1 of either [ claims 1-10 and ] 12-21 alternatively by the difference in how on a screen to point in invention of a publication.

[0241] Invention according to claim 23 can do so the same effectiveness as invention of a publication to one 1 of claims 12-22.

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TECHNICAL FIELD

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[Field of the Invention] This invention relates to information input/output system and a program.

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PRIOR ART

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[Description of the Prior Art] It has the indicating equipment for displaying an alphabetic character and an image in recent years, the coordinate input unit which arranged the information input screen (touch panel side) in the front face of an indicating equipment, and the control unit which performs the display control of an indicating equipment based on the input from a coordinate input unit, and the information input/output system which constituted the screen and the write-in field of an electronic blackboard using the indicating equipment and the coordinate input unit is offered.

[0003] for example, made in Smart Technologies (SMART Technologies Inc.) is smart -- 2000 is in the condition which projected the image of an alphabetic character, a picture, a graphic form, and a graphic on the panel using the liquid crystal projector connected to the computer, and performs processing which downloads the information on handwritten to a computer using the coordinate input unit (write-in field) arranged in the front face of the plane of projection (screen) of a panel. And handwritten information and image information are compounded within a computer, and it enables it to express as real time through a liquid crystal projector again.

[0004] Since the image inputted using the coordinate input unit can be displayed in piles as an overwrite image to the image on the screen currently displayed with the display, at a meeting, a presentation, schools, etc., it is already used widely, and the use effectiveness is highly estimated by such information input/output system. Moreover, it is used also as a teleconference by including communication facility, such as voice and an image, in such information input/output system, and connecting between remote places by the communication line.

[0005] Moreover, the technique of various methods is proposed as a coordinate input unit used for such information input/output system. That is, the optical thing besides [ which has a physical field like a touch panel side as this coordinate input device ] a method is proposed (for example, refer to JP,11-110116,A).

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## EFFECT OF THE INVENTION

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[Effect of the Invention] By easy actuation which points to two or more [ on a screen ] with the finger of one hand etc., since invention given in claims 1 and 12 can display a required actuation image near the location to which it pointed etc., it can operate an actuation image on a screen at hand immediately, and it can raise operability. And since there is no display of an actuation image in pointing to one on a screen, it is easily distinguishable from the actuation performed by pointing to one place.

[0231] In invention given in claims 1 and 12, since invention given in claims 2 and 13 does not display an actuation image when a certain amount of time interval is opened and it points one by one to two or more [ on a screen ], it can distinguish easily the case where it points to two or more [ on a screen ], without aiming at the display of an actuation image.

[0232] In invention according to claim 1, 2, 12, or 13, since invention given in claims 3 and 14 does not display an actuation image when a certain amount of distance spacing is opened and it points to two or more [ on a screen ], it can distinguish easily the case where it points to two or more [ on a screen ], without aiming at the display of an actuation image.

[0233] Invention of a publication can display an actuation image on claims 4 and 15 in the class, number, or display position beforehand registered into 1 of either [ claims 1-3 and ] 12-14 in invention of a publication.

[0234] Since invention given in claims 5 and 16 can be registered into a request of a user about the detail of the actuation image displayed on claims 4 and 15 in invention of a publication, it can raise operability further.

[0235] In invention given in claims 1 and 12, it points on a screen to invention given in claims 6 and 17, and a user can perform predetermined actuation by migration of a location.

[0236] It can be made to display that it pointed on the screen to invention given in claims 7 and 18, and it operated the actuation image in invention given in claims 6 and 17 according to migration of a location.

[0237] It can be made easy to set invention given in claims 8 and 19 to invention given in claims 1 and 12, to expand, to reduce to the size of a request of an actuation image easily, and to operate it.

[0238] Since invention given in claims 9 and 20 can display an actuation image from under the door which moves gradually if the location to which did not display an actuation image but it pointed is moved, when it points to two or more locations on a screen in invention of a publication to claims 1 and 12, and displaying an actuation image not to not much show immediately, it is suitable.

[0239] Invention of a publication can use an icon, a dial, a slider bar, or a pallet for 1 of either [ claims 1-9 and ] 12-20 as an actuation image in invention of a publication at claims 10 and 21.

[0240] Invention of a publication can make claims 11 and 22 display various kinds of actuation images on 1 of either [ claims 1-10 and ] 12-21 alternatively by the difference in how on a screen to point in invention of a publication.

[0241] Invention according to claim 23 can do so the same effectiveness as invention of a publication to one 1 of claims 12-22.

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TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] By the way, when operating various applications etc. on that screen using the above information input/output system, it is possible to carry out by displaying a tool bar on a screen, and carrying out by pointing to the icon on this tool bar by directions members, such as a finger and Penn, or operating remote control of dedication. When pointing to an icon by the directions member, a coordinate input unit detects the coordinate of the location to which the directions member concerned points, and it judges to which icon it is pointing.

[0007] The display used with information input/output system However, 40 inches, If the thing of the big screen of 50 inches is assumed and it is going to point to the icon of the tool bar on a screen (usually displayed on the upper and lower sides of a screen, or an edge on either side) by the directions member Compromise to the location where the desired icon is displayed, or [ lengthening the limbs greatly one by one, in order that a user may operate an icon ] Or it is necessary to start specially, whenever it clicks on an icon, in sitting on a chair and operating it, and there is fault that actuation is very complicated.

[0008] Moreover, in operating [ since it cannot be operated on the screen of information input/output system when operating it with remote control of dedication as mentioned above, while looking at a screen, or ] it, explaining, there is fault that actuation is very complicated too.

[0009] The purpose of this invention is making it possible to operate an icon on a screen at hand immediately, and raising operability.

[0010] Another purpose of this invention is enabling it for the actuation performed by pointing to one on a screen to distinguish easily, when raising this operability.

[0011] Another purpose of this invention is enabling it to distinguish easily the case where it points to two or more [ on a screen ], without aiming at the display of an icon, when raising the aforementioned operability.

[0012] Another purpose of this invention is enabling it to display an icon in the class, number, or display position which is registered beforehand in the aforementioned case.

[0013] Another purpose of this invention is raising operability further, as a user's can register with a request about the detail of the icon which is displayed in the aforementioned case.

[0014] Another purpose of this invention is that point on a screen and a user enables it to perform predetermined actuation by migration of a location.

[0015] Another purpose of this invention is enabling it to display that it pointed on the screen and the actuation image was operated according to migration of a location.

[0016] Another purpose of this invention is making an actuation image easy to expand, to reduce to desired size easily, and to operate it.

[0017] Another purpose of this invention is displaying various kinds of actuation images alternatively by the difference in how on a screen pointing.

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MEANS

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[Means for Solving the Problem] Invention according to claim 1 is equipped with the coordinate input unit which detects the coordinate on the screen concerned of the display which displays an image, and two or more locations to which it pointed on the screen of this display. In the information input/output system which displays said display based on the coordinate detected with said coordinate input unit When it detects pointing to two or more locations in said screen top with the storage which registers the actuation image beforehand, and said coordinate input unit It is the information input/output system characterized by having an actuation image display means to display the actuation image registered into the predetermined location on said screen.

[0019] In this specification, it is the graphic form displayed on a screen, and by performing predetermined actuation with a finger etc. to that graphic form, an actuation image receives that a user performs various actuation to information input/output system, and are an icon, a dial, a slider bar, a pallet, etc.

[0020] Therefore, by easy actuation which points to two or more [ on a screen ] with the finger of one hand etc., since a required actuation image can be displayed near the location to which it pointed etc., an actuation image can be immediately operated on a screen at hand, and operability can be raised. And since there is no display of an actuation image in pointing to one on a screen, it is easily distinguishable from the actuation performed by pointing to one place.

[0021] the time check which clocks the time amount of a between the time of invention according to claim 2 pointing to said two or more locations in invention according to claim 1, respectively -- a means and the 1st comparison means which judges whether it is below the predetermined time to which this clocked time amount is set beforehand -- having -- said actuation image-display means -- said time check -- it is characterized by what said actuation image displays for on condition that time amount is below said predetermined time.

[0022] Therefore, since an actuation image is not displayed when a certain amount of time interval is opened and it points one by one to two or more [ on a screen ], the case where it points to two or more [ on a screen ], without aiming at the display of an actuation image is easily distinguishable.

[0023] A ranging means by which invention according to claim 3 calculates the distance between the coordinates which pointed to said two or more locations, respectively in invention according to claim 1 or 2, It has the 2nd comparison means which judges whether it is below the predetermined distance to which this calculated distance is set beforehand, and said actuation image display means is characterized by what said actuation image is displayed for on condition that said operation distance is said below predetermined distance.

[0024] Therefore, since an actuation image is not displayed when a certain amount of distance spacing is opened and it points to two or more [ on a screen ], the case where it points to two or more [ on a screen ], without aiming at the display of an actuation image is easily distinguishable.

[0025] Invention according to claim 4 is set to invention given in one 1 of claims 1-3. Said storage It is registered about said class at least among the display positions in said display on the basis of at least one of the class of the actuation image registered, its number, and said the two or more coordinates. Said



actuation image display means is characterized by what said actuation image is displayed for according to the contents of registration of said storage.

[0026] Therefore, an actuation image can be displayed in the class, number, or display position registered beforehand.

[0027] In invention according to claim 4, invention according to claim 5 is characterized by having an updating means to update the contents of registration of said storage from the contents of a reception beam concerned, when the reception injury of this input is carried out, a reception means to receive the input of the contents of registration to said storage, and.

[0028] Therefore, since it can register with a request of a user about the detail of the actuation image to display, operability can be raised further.

[0029] Invention according to claim 6 carries out having an actuation means receive and perform predetermined actuation according to detection distance and a direction concerned as the description in invention according to claim 1, when there is said detection by said migration detection means, where a migration detection means point and detect the distance and the direction of migration of a location and said actuation image on said screen are displayed.

[0030] Therefore, it points on a screen and a user can perform predetermined actuation by migration of a location.

[0031] In invention according to claim 6, invention according to claim 7 is characterized by what the display position on said screen of said actuation image is changed for according to detection distance and a direction concerned, when said actuation image display means has detection by said migration detection means, where said actuation image is displayed.

[0032] Therefore, it can be made to display that it pointed on the screen and the actuation image was operated according to migration of a location.

[0033] Invention according to claim 8 is characterized by to have an enlarging-or-contracting means responds in detection distance and a direction concerned, and expand or reduce the magnitude on said screen of said actuation image in invention according to claim 1, when there is said detection by a migration detection means point and detect the distance and the direction of migration of a location and said migration detection means on said screen.

[0034] Therefore, an actuation image can be made easy to expand, to reduce to desired size easily, and to operate it.

[0035] When it detects pointing to two or more locations in said screen top with said coordinate input unit in invention according to claim 1, invention according to claim 9 A door display means to display a door on the predetermined location on said screen, and a migration detection means to point on said screen and to detect the distance and the direction of migration of a location, Where said door is displayed, when there is detection of said migration Having a door modification means to change the display position on said screen of said door according to detection distance and a direction concerned, said actuation image display means displays that said actuation image appears gradually according to migration of the door concerned from under said door by which said display position was changed.

[0036] Therefore, it is suitable when it points to two or more locations in a screen top, and displaying an actuation image not to not much show immediately, since an actuation image can be displayed from under the door which moves gradually if the location to which did not display an actuation image but it pointed is moved.

[0037] Invention according to claim 10 is characterized by what said actuation image is an icon, a dial, a slider bar, or a pallet in invention given in one 1 of claims 1-9.

[0038] Therefore, an icon, a dial, a slider bar, or a pallet can be used as an actuation image.

[0039] Invention according to claim 11 is set to invention given in one 1 of claims 1-10. Said storage Having registered two or more kinds of said actuation images, said actuation image display means is indicated said actuation image by said thing [ carrying out by choosing more than one from the actuation images of a class ], corresponding [ of said location to which it pointed / concerned ] to the number and whether it pointed out and the example was performed to coincidence, or it was carried out one by one.

[0040] Therefore, various kinds of actuation images can be alternatively displayed by the difference in

how on a screen to point.

[0041] Invention according to claim 12 is equipped with the coordinate input unit which detects the coordinate on the screen concerned of the display which displays an image, and two or more locations to which it pointed on the screen of this display. In the program to the computer which makes a computer perform controlling information input/output system which displays said display based on the coordinate detected with said coordinate input unit which can be read When it detects pointing to two or more locations in said screen top with said coordinate input unit, it is the program characterized by making a computer perform actuation image display processing which displays the actuation image beforehand registered into storage on the predetermined location on said screen.

[0042] Therefore, by easy actuation which points to two or more [ on a screen ] with the finger of one hand etc., since a required actuation image can be displayed near the location to which it pointed etc., an actuation image can be immediately operated on a screen at hand, and operability can be raised. And since there is no display of an actuation image in pointing to one on a screen, it is easily distinguishable from the actuation performed by pointing to one place.

[0043] the time check which clocks the time amount of a between the time of invention according to claim 13 pointing to said two or more locations in invention according to claim 12, respectively -- with processing 1st comparison processing which judges whether it is below the predetermined time to which this clocked time amount is set beforehand is performed to a computer -- making -- said actuation image display processing -- said time check -- it is characterized by what said actuation image is displayed for on condition that time amount is said below predetermined time.

[0044] Therefore, since an actuation image is not displayed when a certain amount of time interval is opened and it points one by one to two or more [ on a screen ], the case where it points to two or more [ on a screen ], without aiming at the display of an actuation image is easily distinguishable.

[0045] Invention according to claim 14 is set to invention according to claim 12 or 13. The ranging processing which calculates the distance between the coordinates which pointed to said two or more locations, respectively, A computer is made to perform 2nd comparison processing which judges whether it is below the predetermined distance to which this calculated distance is set beforehand, and said actuation image display processing is characterized by what said actuation image is displayed for on condition that said operation distance is said below predetermined distance.

[0046] Therefore, since an actuation image is not displayed when a certain amount of distance spacing is opened and it points to two or more [ on a screen ], the case where it points to two or more [ on a screen ], without aiming at the display of an actuation image is easily distinguishable.

[0047] Invention according to claim 15 is set to invention given in one 1 of claims 12-14. Said actuation image display processing It is characterized by what said actuation image is displayed [ among the display positions in said display on the basis of at least one of the class of the actuation image registered, its number, and said the two or more coordinates ] for according to the contents of registration of said storage registered about said class at least.

[0048] Therefore, an actuation image can be displayed in the class, number, or display position registered beforehand.

[0049] In invention according to claim 15, invention according to claim 16 is characterized by making a computer perform the update process which updates the contents of registration of said storage from the contents of a reception beam concerned, when the reception injury of this input is carried out with the reception processing which receives the input of the contents of registration to said storage.

[0050] Therefore, since it can register with a request of a user about the detail of the actuation image to display, operability can be raised further.

[0051] Invention according to claim 17 makes a computer perform migration detection processing of pointing on said screen and detecting the distance and the direction of migration of a location in invention according to claim 12, and actuation image-display processing carries out what it is what changes the display position on said screen of said actuation image according to detection distance and a direction concerned as the description, when this detection is in the condition that said actuation image was displayed.

[0052] Therefore, it points on a screen and a user can perform predetermined actuation by migration of a location.

[0053] In invention according to claim 17, invention according to claim 18 is characterized by making a computer perform actuation processing which receives and performs predetermined actuation according to detection distance and a direction concerned, when there is said detection by said migration detection means, where said actuation image is displayed.

[0054] Therefore, it can be made to display that it pointed on the screen and the actuation image was operated according to migration of a location.

[0055] It carries out that invention according to claim 19 makes a computer perform the enlarging-or-contracting processing which responds in detection distance and a direction concerned, and expands or reduces in the magnitude on said screen of said actuation image when there is said detection by the migration detection processing in which point and the distance and the direction of migration of a location are detected and said migration detection processing on said screen, in invention according to claim 12 as the description.

[0056] Therefore, an actuation image can be made easy to expand, to reduce to desired size easily, and to operate it.

[0057] When it detects pointing to two or more locations in said screen top with said coordinate input unit in invention according to claim 12, invention according to claim 20 Door display processing which displays a door on the predetermined location on said screen, and migration detection processing in which point on said screen and the distance and the direction of migration of a location are detected, Where said door is displayed, when there is detection of said migration A computer is made to perform door modification processing in which the display position on said screen of said door is changed according to detection distance and a direction concerned. Said actuation image display processing It is displayed that said actuation image appears gradually according to migration of the door concerned from under said door by which said display position was changed.

[0058] Therefore, it is suitable when it points to two or more locations in a screen top, and displaying an actuation image not to not much show immediately, since an actuation image can be displayed from under the door which moves gradually if the location to which did not display an actuation image but it pointed is moved.

[0059] Invention according to claim 21 is characterized by what said actuation image display processing displays an icon, a dial, a slider bar, or a pallet for as said actuation image in invention given in one 1 of claims 12-20.

[0060] Therefore, an icon, a dial, a slider bar, or a pallet can be used as an actuation image.

[0061] It is characterized by carrying out by invention according to claim 22 choosing in invention given in one 1 of claims 12-21 from the actuation images with which two or more kinds of said actuation image display processings are registered into said storage in the display of said actuation image, corresponding [ of said location to which it pointed / concerned ] to the number and whether it pointed out and the example was performed to coincidence, or it was carried out one by one.

[0062] Therefore, various kinds of actuation images can be alternatively displayed by the difference in how on a screen to point.

[0063] Invention according to claim 23 is a storage characterized by having memorized the program of a publication to one 1 of claims 12-22.

[0064] Therefore, the same operation as invention of a publication and effectiveness can be done so to one 1 of claims 12-22.

[0065]

[Embodiment of the Invention] The gestalt of 1 implementation of this invention is explained.

[0066] Drawing 1 is the appearance perspective view showing roughly the information input/output system 1 which is the gestalt of this operation, and drawing 2 is the block diagram showing electric connection of the information input/output system 1. As shown in drawing 1 and drawing 2, the information input/output system 1 is equipped with the panel section 4 which is the I/O device which consists of the plasma display panels (PDP) 2 and the coordinate input units 3 which are an indicating

equipment, the computers 5, such as a personal computer, the scanner 6 for reading the image of a manuscript, the printer 7 that outputs image data to the detail paper, and the device stowage 9 which contains a video player 8.

[0067] PDP2 is a thing big screen type [, such as 40 inches available as an electronic blackboard and 50 etc. inches, ], and CRT, LCD, etc. may be used for it as long as it is this big screen type of display.

Moreover, although illustration is omitted, the video input terminal and the loudspeaker are formed in PDP2, and a video player 8 is begun, in addition various information machines and equipment and AV equipments, such as a laser disk player, a DVD player, and a video camera, are connected, and it has composition which can use PDP2 as a big screen monitor.

[0068] As shown in drawing 2 , the information input/output system 1 is a configuration which connects PDP2, a scanner 6, a printer 7, and a video player 8 to a computer 5, respectively, and controls the whole system by the computer 5. Moreover, the controller 10 for coordinate input unit 3 which performs the operation of the position coordinate in information input area 3a directed by predetermined bodies, such as directions members, such as Penn, and a fingertip, etc. is connected to the computer 5, and the coordinate input unit 3 is also connected to the computer 5 through this controller 10. Moreover, it is also possible to transmit the data which could connect the information input/output system 1 to the network 11 through the computer 5, and displayed the data created by other computers connected on the network 11 on PDP2, or were created with the information input/output system 1 to other computers.

[0069] Next, a computer 5 is explained. Here, drawing 3 is the block diagram showing the electrical installation of each part built in a computer 5. As shown in drawing 3 , CPU12 by which a computer 5 controls the whole system, and RAM14 used as a work area of ROM13 and CPU12 which recorded the bootstrap etc. are connected through the bus 21. Moreover, the keyboard 15 for inputting an alphabetic character, a numeric value, various directions, etc. into a bus 21 through a predetermined interface, The mouse 16 for performing migration, a range selection, etc. of cursor, and the hard disk 17 which is a store, With the graphics board 18 which is connected to PDP2 and controls the display of the image to the PDP2 The interface (I/F) 20 for the network card (or modem) 19 for connecting with a network 11 being connected, and connecting controller 10, scanner 6, and printer 7 grade is also connected.

[0070] Various application program 24 grades, such as the device driver 23 for operating the coordinate input device 3 on a computer 5 through an operating system (OS) 22 and a controller 10, and drawing software word processor software, spreadsheet software presentation software calibration software, are stored in the hard disk 17.

[0071] moreover, the record medium 26 (a flexible disk --) which recorded various kinds of program codes (control program) of OS22, a device driver 23, or various application program 24 grades on the computer 5 A hard disk, an optical disk (CD-ROM, CD-R, CD-R/W, DVD-ROM, DVD-RAM, etc.), The program reader 25 (it responds to the recording method of a record medium 26) which is equipment which reads the program code currently recorded for the ability using various kinds of media, such as a magneto-optic disk (MO) and a memory card equipments, such as flexible disk drive equipment, CD-ROM drive equipment, and MO drive equipment, -- it can use -- it is carried.

[0072] The various application programs 24 are executed by CPU12 under control by OS22 started according to the injection of the power source to a computer 5. For example, when drawing software is started by predetermined actuation of a keyboard 15 and a mouse 16, the predetermined image based on drawing software is displayed on PDP2 through a graphics board 18. Moreover, a device driver 23 is also started with OS22, and will be in the condition in which the data input from the coordinate input device 3 through a controller 10 is possible. Thus, where drawing software is started, when a user traced and draws an alphabetic character, a graphic form, etc. on information input area 3a of the coordinate input unit 3 by directions members, such as a finger, Rhine to which the migration locus of a directions member is connected to the image on the screen where the coordinate information on the migration locus of the directions member is inputted into a computer 5 as image data, for example, is displayed on PDP2 is displayed in piles as an overwrite image. Or the image of the field to which the migration locus of a directions member is connected conversely is eliminated. And he is trying for the location on screen 2a of PDP2 which displays this image in piles or eliminates an image to lap with the location which the

user traced and drew by directions members, such as a finger, by information input area 3a.

[0073] If the case where a line and an alphabetic character are overwritten is explained more to a detail at an example, CPU12 of a computer 5 writes the drawing information for drawing a line and an alphabetic character based on the inputted image data in the video memory (not shown) which generates and is prepared for a graphics board 18 according to the position coordinate based on the inputted coordinate information. Then, when a graphics board 18 transmits to PDP2 by making into a picture signal drawing information written in video memory, the same alphabetic character as the alphabetic character written by the user will be displayed on PDP2. That is, since the computer 5 recognizes the coordinate input device 3 as a pointing device like a mouse 16, by computer 5, the same processing as the case where an alphabetic character is written using a mouse 16 on drawing software will be performed.

[0074] Next, the coordinate input unit 3 is explained to a detail. In addition, as a coordinate input unit 3 which can be applied to the information input/output system 1 of the gestalt of this operation, the thing of the various methods with which detection methods differ can be considered. For example, a touch panel can be mentioned as a coordinate input device 3 which detects mechanically and electrically the coordinate location to which a directions member points on screen 2a of PDP2 (information input area 3a).

[0075] However, below, five things (1st coordinate input unit 3A- 5th coordinate input unit 3E) from which a detection method differs are mentioned about the coordinate input unit 3 which detects optically the coordinate location to which a directions member points as a more suitable example on screen 2a of PDP2 (information input area 3a), and the configuration and principle are explained.

[0076] A. Explain the 1st coordinate input unit \*\*\*\* and 1st coordinate input unit 3A based on drawing 4 - drawing 8 . The so-called recursive light electric shielding method is used for this 1st coordinate input unit 3A.

[0077] Here, drawing 4 is the explanatory view showing roughly the configuration of 1st coordinate input unit 3A. As shown in drawing 4 , coordinate input unit 3A is equipped with information input area 3a of the shape of an oblong square in the size corresponding to the size of screen 2a of PDP2. This information input area 3a is a field which enables the input of an alphabetic character, a graphic form, etc. by tracing with a finger etc. Near the corner located in the lower part both ends of this information input area 3a, the optical unit 27 (left-hand side optical unit 27L, right-hand side optical unit 27R) which performs luminescence and light-receiving is formed by whenever [ predetermined champing-angle ]. From these optical units 27, by the shape of a sector which consists of a flat surface or a bundle of light (probe light) almost of nothing, for example, L1, L2, L3, ..., Ln (R1, R2, R3, ..., Rn), for a flat surface, the thin film-like flux of light film is floodlighted in parallel along the front face of screen 2a of PDP2 so that it may spread throughout information input area 3a.

[0078] Moreover, the recurrence reflective member 28 is formed in the periphery except the lower part of information input area 3a of the coordinate input unit 3. This recurrence reflective member 28 arranges many cube corner reflectors of for example, a cone configuration, and is formed, and it has the property reflected towards a position, without depending the light which carried out incidence on whenever [ that incident angle ]. For example, it will be reflected by the recurrence reflective member 28 and the probe light L3 floodlighted from left-hand side optical unit 27L will be received by left-hand side optical unit 27L as retroreflection light L3' which follows the same optical path again. That is, information input area 3a is formed also of the recurrence reflective member 28.

[0079] Next, the optical unit 27 is explained. Here, drawing 5 is the block diagram showing the structure of the optical unit 27 roughly. In addition, although drawing 5 shows the subject the direction of x-z, it is drawing which looked at the component same about the part shown with a two-dot chain line from another (the direction of x-y, or the direction of y-z).

[0080] As shown in drawing 5 , the optical unit 27 is equipped with the floodlighting means 29 and the light-receiving means 30. The floodlighting means 29 is equipped with the light sources 31, such as possible LD (LaserDiode) of extracting a spot to some extent, and Pinpoint LED (Light Emitting Diode). The light perpendicularly irradiated from this light source 31 to screen 2a of PDP2 is collimated



in the x directions by the cylindrical lens 32 which can change only the scale factor of an one direction. The light collimated by the cylindrical lens 32 in the x directions is condensed to the direction of y by the cylindrical lenses 33 and 34 of two sheets the cylindrical lenses and distribution of curvature cross at right angles in a cylindrical lens 32. That is, the field which condensed the light from the light source 31 to the line will be formed behind a cylindrical lens 34 of an operation of these cylindrical-lens groups (cylindrical lenses 32, 33, and 34). The slit plate 35 which has a narrow slit long and slender in x directions in the direction of y is arranged here. Therefore, the light which passed the cylindrical-lens group (cylindrical lenses 32, 33, and 34) forms the linear secondary light source 36 in the slit location of the slit plate 35. The light emitted from the secondary light source 36 is turned up by the half mirror 37, it is the parallel light which met the front face of screen 2a, without spreading in the perpendicular direction of screen 2a of PDP2, and as in parallel as screen 2a, serves as flux of light film of the shape of a sector centering on the secondary light source 36, and advances information input area 3a. If it puts in another way, sector-like light will form information input area 3a. Condensing optical system is formed with these cylindrical-lens groups (cylindrical lenses 32, 33, and 34) and slit plates 35.

[0081] As mentioned above, it will be recursively reflected by the recurrence reflective member 28, and the flux of light film which became sector-like and ran information input area 3a will follow the same optical path again, and will return to a half mirror 37. Therefore, the flux of light film recursively reflected by the recurrence reflective member 28 also forms information input area 3a.

[0082] The retroreflection light which was reflected by the recurrence reflective member 28 and returned to the half mirror 37 penetrates a half mirror 37, and it carries out incidence to the light-receiving means 30. After retroreflection light which carried out incidence to the light-receiving means 30 is made into a line through the cylindrical lens 38 which is a condenser lens, it is received in a location which is different for every probe light in CCD39 prepared at intervals of distance f (f is the focal distance of a cylindrical lens 38) from this cylindrical lens 38. In addition, CCD39 of the gestalt of this operation is 1-dimensional CCD, and the number of pixels is made into 2,048 pixels.

[0083] In the direction of the z-axis, the retroreflection light reflected in the detail by the recurrence reflective member 28 does not receive an operation of a cylindrical lens 38, but while it had been collimated by it, it reaches CCD39. Moreover, image formation of the retroreflection light is carried out on CCD39 which spread so that it might condense at the core of a cylindrical lens 38 with screen 2a of PDP2, if parallel, consequently was installed in the focal plane of a cylindrical lens 38 in response to the operation of a cylindrical lens 38. Thereby, according to the existence of retroreflection light, distribution of optical reinforcement is formed on CCD39. That is, when retroreflection light is interrupted by the directions member P, the point (peak point mentioned later) that optical reinforcement is weak will arise in the location equivalent to the retroreflection light by which it was interrupted on CCD39. CCD39 which received retroreflection light generates the electrical signal based on the optical intensity distribution of retroreflection light (probe light), and outputs it to the controller 10 mentioned above. In addition, as shown in drawing 5, both the secondary light source 36 and the cylindrical lens 38 are arranged in the location of distance d to a half mirror 37, and are in physical relationship [ \*\*\*\* ].

[0084] Here, drawing 6 is the block block diagram of the controller 10 which performs processing which specifies the coordinate of the location where the light which the electrical signal based on the optical intensity distribution of retroreflection light is inputted from a photo detector 39, and advances information input area 3a was interrupted. This controller 10 calculates luminescence control of the light source (LD) 31 of the optical unit 27 (left-hand side optical unit 27L, right-hand side optical unit 27R), and the output from CCD39 of the optical unit 27 (left-hand side optical unit 27L, right-hand side optical unit 27R). As shown in drawing 6, the bus connection of the interface 43, A/D converter 44, and the LD driver 45 for connecting with ROM41 which CPU40 which controls each part intensively is formed in the controller 10, and records a program and data on this CPU40, RAM42 which stores various data, enabling free rewriting and functions as a work area, and a computer 5 is carried out. Moreover, the bus connection of EEPROM47 which is the memory of a hard disk 46 or a non-volatile which stores various kinds of program codes (control program) is carried out to CPU40. The



microcomputer is constituted by CPU40, ROM41, and RAM42 here. The program readers 48, such as flexible disk drive equipment which is equipment which reads the program code currently recorded on the record medium 49 which recorded various kinds of program codes (control program), i.e., a flexible disk, a hard disk, optical disks (CD-ROM, CD-R, CD-R/W, DVD-ROM, DVD-RAM, etc.), the magneto-optic disk (MO), the memory card, etc., CD-ROM drive equipment, and MO drive equipment, are connected to such a microcomputer.

[0085] As a circuit which calculates the output from CCD39, the analog processing circuit 51 is connected to the output terminal of CCD39, as shown in drawing. Within CCD39, the reflected light which carried out incidence to CCD39 is changed into the image data of an analog with the electrical-potential-difference value according to luminous intensity, and is outputted as an analog signal. After this analog signal is processed in the analog processing circuit 51, it is changed into a digital signal by A/D converter 44, and is passed to CPU40. Then, the operation of the 2-dimensional coordinate of the directions member P is performed by CPU40.

[0086] Various kinds of program codes (control program) recorded on various kinds of program codes (control program) or record media 49 which were stored in the hard disk 46 will be written in RAM42 according to the injection of the power source to a controller 10, and various kinds of program codes (control program) will be performed.

[0087] Then, the function performed by CPU40 based on a control program is explained. Here, the coordinate detection processing which is the features-function with which the coordinate input unit 3 of the gestalt of this operation is equipped is explained concretely below.

[0088] Here, drawing 7 is the front view showing an example which pointed by the directions member P to one in information input area 3a of the coordinate input unit 3. When the n-th probe light Ln is interrupted by the directions member P in the light of the shape of a sector which consists of probe light called L1, L2, L3, ..., Ln which were irradiated from left-hand side optical unit 27L as shown in drawing 7 for example, the probe light Ln does not reach the recurrence reflective member 28.

[0089] At this time, the optical intensity distribution on CCD39 are considered. Here, drawing 8 is the explanatory view showing detection actuation of CCD39 typically. Although the optical intensity distribution on CCD39 are almost fixed if the directions member P is not inserted into information input area 3a Since the probe light Ln is not received by CCD39 of the optical unit 27 when the directions member P is inserted into information input area 3a and the probe light Ln is interrupted by the directions member P, as shown in drawing 8, The position Xn on CCD39 of the optical unit 27 corresponding to the probe light Ln serves as a field (scotoma) where optical reinforcement is weak. Since the location Xn which is the field (scotoma) where this optical reinforcement is weak will appear in the wave of the optical reinforcement outputted from CCD39 as a peak point, CPU40 recognizes the appearance of the peak point in the wave of such optical reinforcement by change of an electrical potential difference, and it detects the location Xn of the scotoma used as the wave-like peak point of this optical reinforcement.

[0090] Moreover, detection of the scotoma location Xn used as the wave-like peak point of optical reinforcement detects the distance from the scotoma location Xn to the main pixel of CCD39 based on the pixel number (for example, setting to drawing 8 the pixel number m) of CCD39.

[0091] The location Xn (the CCD39 top of left-hand side optical unit 27L the XnL and CCD39 top of right-hand side optical unit 27R XnR) which is the field (scotoma) where optical reinforcement is weak corresponds with the outgoing radiation / incident angle thetan of the interrupted probe light, and can know thetan by detecting Xn. That is, when distance from the scotoma location Xn to the main pixel of CCD39 is set to a, thetan is a function of a.  $\text{thetan} = \tan^{-1}(a/f)$  ..... (1)

It can express. However, f is the focal distance of a cylindrical lens 38. thetan in left-hand side optical unit 27L is replaced with thetanL here, and a is replaced with XnL.

[0092] Furthermore, it is  $\text{thetanL} = g(\text{thetanL})$  as a function of XnL asked for include-angle thetanL of the directions member P and left-hand side optical unit 27L to make by (1) formula in drawing 7 with the transform coefficient g of the geometric relative-position relation between left-hand side optical unit 27L and information input area 3a. .... (2)

However, it can express  $\theta_{L} = \tan^{-1} (X_{nL}/f)$ .

[0093] Similarly, the notation L in above-mentioned (1) (2) type is transposed to Notation R also about right-hand side optical unit 27R, and it is  $\theta_{R} = h(\theta_{L})$  by the transform coefficient h of the geometric relative-position relation between right-hand side optical unit 27R and information input area 3a. .... (3)

However, it can express  $\theta_{R} = \tan^{-1} (X_{nR}/f)$ .

[0094] If [ here ] w which shows the distance of the center position of CCD39 of left-hand side optical unit 27L, and the center position of CCD39 of right-hand side optical unit 27R to drawing 7, the two-dimensional coordinate (x y) of the point directed by the directions member P in information input area 3a is the principle of triangulation.  $X = w - \tan \theta_{R} / (\tan \theta_{L} + \tan \theta_{R})$  ..... (4)

$Y = w - \tan \theta_{L} - \tan \theta_{R} / (\tan \theta_{L} + \tan \theta_{R})$  .... (5)

It is computable by carrying out.

[0095] These (1), (2), (3), (4), and (5) types are beforehand stored in the hard disk 46 or the record medium 49 as a part of control program, and the position coordinate (x y) of the directions member P is computed by (1), (2), (3), (4), and (5) type as a function of  $X_{nL}$  and  $X_{nR}$ . That is, the position coordinate (x y) of the directions member P will be computed by detecting the location of the scotoma on CCD39 of left-hand side optical unit 27L, and the location of the scotoma on CCD39 of right-hand side optical unit 27R.

[0096] Thus, the position coordinate (x y) of the computed directions member P will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.

[0097] And according to such coordinate input unit 3A, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparence, and high drawing.

[0098] B. Explain the 2nd coordinate input unit, next coordinate input unit of \*\* 2nd 3B based on drawing 9 - drawing 11. In addition, about the same part as the part explained by 1st coordinate input unit 3A, explanation is also omitted using the same sign.

[0099] This 2nd coordinate input unit 3B is the so-called coordinate input unit of a recursive light reflex method.

[0100] Here, drawing 9 is the perspective view showing the directions member 61 used for coordinate input unit 3B. Moreover, drawing 10 is the front view showing an example which pointed by the directions member 61 to one in information input area 3a of coordinate input unit 3B. The recurrence reflective member 62 is formed near the tip of the directions member 61 used in order to point to one in information input area 3a of coordinate input unit 3B, as shown in drawing 9. This recurrence reflective member 62 arranges many cube corner reflectors of for example, a cone configuration, and is formed, and it has the property reflected towards a position, without depending the light which carried out incidence on whenever [ that incident angle ]. For example, it will be reflected by the recurrence reflective member 62 and the probe light  $L_n$  floodlighted from left-hand side optical unit 27L will be received by left-hand side optical unit 27L as retroreflection light  $L_n'$  which follows the same optical path again, as shown in drawing 10. Therefore, as shown in drawing 10, in coordinate input unit 3B, it is not necessary to form the recurrence reflective member 28 in information input area 3a like coordinate input unit 3A mentioned above. In addition, the directions member 61 is carrying out the Penn-like configuration, and its quality of the materials, such as rubber and plastics, are more desirable than glossy metal.

[0101] Therefore, it inserts in the suitable location (x y) of information input area 3a of coordinate input unit 3B near [ equipped with the recurrence reflective member 62 of such a directions member 61 ] the tip. For example, when the probe light  $L_n$  in the flux of light film of the shape of a sector floodlighted from left-hand side optical unit 27L is reflected by the recurrence reflective member 62 of the directions member 61, the retroreflection light  $L_n'$  is received by CCD39 of left-hand side optical unit 27L. Thus, when CCD39 receives retroreflection light  $L_n'$ , the position  $D_n$  on CCD39 corresponding to retroreflection light  $L_n'$  serves as a field (bright point) where optical reinforcement is strong. That is, as shown in drawing 11, on CCD39, the field where optical reinforcement is strong is generated in the location of a location  $D_n$ , and a peak appears in the configuration of the luminous-intensity distribution

from CCD39. The location  $D_n$  where this peak appears corresponds with the outgoing radiation / incident angle  $\theta_n$  of the reflected probe light, and can know  $\theta_n$  by detecting  $D_n$ . That is, the position coordinate (x y) of the directions member 61 will be computed by the technique of triangulation based on the peak which appears in the wave of optical reinforcement like coordinate input unit 3A of a recursive light electric shielding method which mentioned above also in coordinate input unit 3B of such a recursive light reflex method.

[0102] Thus, the position coordinate (x y) of the computed directions member 61 will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.

[0103] And according to such coordinate input unit 3B, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparence, and high drawing. In addition, not using the above directions members 61, a finger etc. can also be used as a directions member.

[0104] C. Explain the 3rd coordinate input unit, next 3rd coordinate input unit 3C based on drawing 12 - drawing 14. In addition, about the same part as the part explained by 1st coordinate input unit 3A, explanation is also omitted using the same sign.

[0105] This 3rd coordinate input unit 3C is the modification of the optical unit in 1st coordinate input unit 3A. Although the sector-like flux of light film was floodlighted in the detail in the optical unit 27 used by 1st coordinate input unit 3A and the information input area was formed in it, in coordinate input unit 3C, it has rotation scan systems, such as a polygon mirror, and the optical unit 70 which floodlights to a radial the light beam in which outgoing radiation was carried out by the rotation scan system from the light source, and forms an information input area is used.

[0106] Here, drawing 12 is the top view showing the optical unit 70 roughly. As shown in drawing 12, it has floodlighting means 70a which consists of LD (Laser Diode)71, the half mirror 72 and the polygon mirror 73 which are the light source which the optical unit 70 has a drive circuit (not shown), and carries out outgoing radiation of the laser beam, and a condenser lens 74, and a photo detector 75. The photo detector 75 consists of PDs (Photo Diode) prepared from the condenser lens 74 at intervals of distance  $f$  ( $f$  is the focal distance of a condenser lens 74). Such an optical unit 70 carries out sequential reflection at a radial by the polygon mirror 73 in which a rotation drive is carried out by the pulse motor (not shown) by predetermined angular-velocity  $\omega$ , after turning up the laser beam which carried out outgoing radiation from LD71 by the half mirror 72. Therefore, the optical unit 70 will repeat and floodlight beam light to a radial. That is, information input area 3a will be formed of the beam light floodlighted by the radial from two optical units 70. It is reflected by the polygon mirror 73 and the beam light which it was reflected and carried out incidence to the optical unit 70 on the other hand reaches a half mirror 72. The reflective beam light which reached the half mirror 72 penetrates a half mirror 72, reaches a photo detector 75, and is changed into an electrical signal.

[0107] Next, coordinate input unit 3C which replaced with and applied such an optical unit 70 to the optical unit 27 used by 1st coordinate input unit 3A is explained. If the beam light by which the directions member P is inserted in a certain location in information input area 3a is covered as shown in drawing 13, since it is not reflected by the recurrence reflective member 28, the beam light will not reach a photo detector 75. Thus, when the beam light by which the directions member P is inserted in a certain location in information input area 3a is covered, a DIP appears in the configuration of the luminous-intensity distribution from a photo detector 75.

[0108] Although optical reinforcement shows " $I=I_1$ " when the directions member P is not inserted in information input area 3a as it is shown in drawing 14, although detailed explanation is omitted since it is technically well-known about the electrical installation of each part, as for optical reinforcement, " $I=I_0$ " will be shown, when the directions member P is inserted in information input area 3a and recursive light does not return to a photo detector 75. Thus, the part whose optical reinforcement is " $I=I_0$ " is a DIP. In addition, among drawing 14, time amount  $t=t_0$  is the criteria location of rotation of the polygon mirror 73, and is a time of the beam light by which a rotation scan is carried out reaching a predetermined include angle.

[0109] Therefore, in the time amount  $t$  from which optical reinforcement became " $I=I_0$ ", if it is  $t_1$ , the outgoing radiation include angle  $\theta$  of the beam light covered by the directions member P inserted in

information input area 3a is computed as  $\theta = \omega(t_1 - t_0) = \omega \cdot t$ . That is, the outgoing radiation include angle  $\theta$  ( $\theta_{L}$ ,  $\theta_{R}$ ) of the beam light covered by the directions member P inserted in information input area 3a in the optical unit 70 (70L, 70R) prepared in each right and left is computed. The position coordinate (x y) which inserted the directions member P by the technique of triangulation based on those outgoing radiation include angles  $\theta$  ( $\theta_{L}$ ,  $\theta_{R}$ ) will be computed.

[0110] Thus, the position coordinate (x y) of the computed directions member P will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.

[0111] And according to such coordinate input unit 3C, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparency, and high drawing.

[0112] D. Explain the 4th coordinate input unit, next 4th coordinate input unit 3D based on drawing 15 - drawing 16. In addition, about the same part as the part explained by 2nd coordinate input unit 3B and 3rd coordinate input unit 3C, explanation is also omitted using the same sign.

[0113] This 4th coordinate input unit 3D is the modification of the optical unit in 2nd coordinate input unit 3B. Although the sector-like flux of light film was floodlighted in the detail in the optical unit 27 used by 2nd coordinate input unit 3B and the information input area was formed in it, in 4th coordinate input unit 3D, it has rotation scan systems, such as a polygon mirror, and the optical unit 70 which floodlights to a radial the light beam in which outgoing radiation was carried out by the rotation scan system from the light source, and forms an information input area is used. In addition, since 3rd coordinate input unit 3C explained, the explanation about the optical unit 70 is omitted here.

[0114] Coordinate input unit 3D which replaced with and applied such an optical unit 70 to the optical unit 27 used by 2nd coordinate input unit 3B is explained. As shown in drawing 15, when the directions member 61 is inserted in a certain location in information input area 3a, retroreflection of the predetermined beam light is carried out in the recurrence reflective member 62 of the directions member 61, and the beam light reaches a photo detector 75. Thus, when retroreflection of the beam light by which the directions member 61 is inserted in a certain location in information input area 3a is carried out, a peak appears in the configuration of the luminous-intensity distribution from a photo detector 75.

[0115] Although optical reinforcement shows " $I=I_0$ " when the directions member 61 is not inserted in information input area 3a as it is shown in drawing 16, although detailed explanation is omitted since it is technically well-known about the electrical installation of each part, as for optical reinforcement, " $I=I_1$ " will be shown, when the directions member 61 is inserted in information input area 3a and recursive light reaches a photo detector 75. Thus, the part whose optical reinforcement is " $I=I_1$ " is a peak. In addition, among drawing 16, time amount  $t=t_0$  is the criteria location of rotation of the polygon mirror 73, and is a time of the beam light by which a rotation scan is carried out reaching a predetermined include angle.

[0116] Therefore, in the time amount  $t$  from which optical reinforcement became " $I=I_1$ ", if it is  $t_1$ , the outgoing radiation include angle  $\theta$  of the beam light in which retroreflection was carried out by the directions member 61 inserted in the information input area 3a is computed as  $\theta = \omega(t_1 - t_0) = \omega \cdot t$ . That is, the outgoing radiation include angle  $\theta$  ( $\theta_{L}$ ,  $\theta_{R}$ ) of the beam light in which retroreflection was carried out by the directions member 61 inserted in information input area 3a in the optical unit 70 (70L, 70R) prepared in each right and left is computed. The position coordinate (x y) which inserted the directions member 61 by the technique of triangulation based on those outgoing radiation include angles  $\theta$  ( $\theta_{L}$ ,  $\theta_{R}$ ) will be computed.

[0117] Thus, the position coordinate (x y) of the computed directions member 61 will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.

[0118] And according to such coordinate input unit 3D, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparency, and high drawing.

[0119] E. Explain the 5th coordinate input unit, next coordinate input unit of \*\* 5th 3E based on drawing 17 - drawing 18. This 5th coordinate input unit 3E is the so-called coordinate input unit of the camera image pick-up method which incorporates the image information in an information input area with an image pick-up camera, and detects a position coordinate based on the part of that incorporated

image information.

[0120] Here, drawing 17 is the front view showing roughly the configuration of 5th coordinate input unit 3E. The image pick-up camera 82 which is an image pick-up means separates distance  $w$  in the upper part both ends of information input area 3a in 5th coordinate input unit 3E, and is formed in them. The photo detector 83 and the image formation optical lens 84 which are CCD (Charge Coupled Device) separate distance  $f$  to the image pick-up camera 82, and are prepared in it. The image pick-up field angle of these image pick-up cameras 82 is about 90 degrees, and it is installed, respectively so that information input area 3a may be made into photographic coverage. Moreover, the image pick-up camera 82 is installed so that it may become a predetermined distance from screen 2a of PDP2 which forms a coordinate input screen, and the optical axis is parallel to screen 2a of PDP2.

[0121] In addition, it is the periphery section except the upper part of information input area 3a, and the whole photography visual field is prepared in the background plate 85 in the wrap location, without barring the image pick-up field angle of the image pick-up camera 82. This background plate 85 turns that field in the center of information input area 3a, and is formed in an abbreviation perpendicular to screen 2a of PDP2. Let this background plate 85 be uniform black, for example.

[0122] The signal of the image pick-up camera 82 and relation with the directions member P are shown in drawing 18. As shown in drawing 18, when the directions member P is inserted in information input area 3a, the directions member P is photoed by the image pick-up camera 82, and the image of the directions member P is formed on the photo detector 83 of the image pick-up camera 82. In the background plate 85 is black like 5th coordinate input unit 3E and using a finger as a directions member P, since the directions member P will have a high reflection factor compared with the background plate 85, the part equivalent to the directions member P of a photo detector 83 serves as a field (bright point) where optical reinforcement is strong.

[0123] Since it is technically well-known about the electrical installation of each part, detailed explanation is omitted, but as shown in drawing 18, when the directions member P is inserted in information input area 3a, a peak appears in the configuration of the luminous-intensity distribution from a photo detector 83. The location  $D_n$  where this peak appears supports include-angle  $\theta$  of the appearance of the directions member P from the principal point of the image formation optical lens 84, and  $\theta$  can express it as  $\theta = \arctan(D_n/f)$  as a function of  $D_n$ . That is, the position coordinate (x y) of the directions member P will be computed by the technique of triangulation based on the peak which appears in the wave of optical reinforcement like coordinate input unit 3A which mentioned above also in 5th coordinate input unit 3E of such a camera image pick-up method.

[0124] Thus, the position coordinate (x y) of the computed directions member P will be outputted to a computer 5 through a controller 10, and will be used for predetermined processing.

[0125] In addition, as a directions member P, exclusive Penn with a light emitting device to whom self emits light can apply.

[0126] And according to such 5th coordinate input unit 3E, in information input area 3a, it is possible to realize a feeling of parallax free, perfect transparency, and high drawing.

[0127] Then, the explanation is omitted about the processing currently performed by the conventional information input/output system among the processings in the drawing software which is one of the various application programs 24 performed in the information input/output system 1 of the gestalt of this operation, and the same processing, and the function relevant to the features-function with which the information input/output system 1 is equipped is explained below.

[0128] As shown in drawing 19, in drawing software, the tool bars 91 and 92 which enable actuation of the various functions by the user are displayed. And if it points to the location where the icon 93 contained in these tool bars 91 and 92 is displayed with a finger etc., since the coordinate input unit 3 will detect the coordinate of that location and it will click on an icon 93, various actuation is attained.

[0129] Screen 2a is a big screen, such as 40 inches or 50 inches. However, moreover, the tool bars 91 and 92 Since it displays on the upper and lower sides of screen 2a, or an edge on either side, usually, User M Compromise to the location where the desired icon 93 is displayed, or [ lengthening the limbs greatly one by one, in order to click on an icon 93 ] Or it is necessary to start specially, whenever it



clicks on an icon 93, in sitting on a chair and operating it, and actuation is complicated.

[0130] So, in drawing software, various kinds of processings in which it explains below are performed, and operability is raised. That is, drawing software displays various actuation images on screen 2a corresponding to a user performing various actuation on screen 2a with a finger etc.

[0131] Here, an actuation image is a graphic form displayed on a screen, and when a user performs predetermined actuation with a finger etc. to that graphic form, it receives that a user performs various actuation (various actuation concerning drawing software at this example) to the information input/output system 1.

[0132] That is, a user detects the difference in the actuation performed on screen 2a using a finger etc., displays a different actuation image for the actuation of every on screen 2a, and receives various actuation from a user through the displayed actuation image.

[0133] Drawing 20 is an explained flow chart which takes lessons from this processing one example. As shown in drawing 20, when the coordinate input unit 3 detects having pointed to 2 on screen 2a, and Points Pa and Pb (referring to drawing 21) to coincidence with the finger etc. (Y of step S1), Or the coordinate input unit 3 detects having pointed to 1 on screen 2a, and Point Pa (Y of step S2). With the condition of having pointed within fixed time amount T set up beforehand after this detection to (N of step S3), and Point Pa (referring to drawing 21), When the coordinate input unit 3 detects what coincidence pointed to other points Pb (refer to drawing 21), (Y of step S4), The distance of the coordinate location of the Point Pa and Point Pb which were detected is computed (step S5). When the distance is below the distance d set up beforehand, (Y of step S6), The icon 94 (refer to drawing 22) as an example of the actuation image contained in the drawing software beforehand stored in the hard disk 1 among the various icons 93 currently used with this drawing software is displayed on the predetermined field to which it is beforehand set up near the point Pb (step S7). Step S7 has realized an actuation image display means and actuation image display processing. step S3 -- a time check -- a means and a time check -- processing, the 1st comparison means, and 1st comparison processing are realized. Step S5 realizes a ranging means and ranging processing, and step S6 has realized the 2nd comparison means and 2nd comparison processing.

[0134] The example of drawing 22 shows the example which displays three, Rhine tool icon 94a, eraser icon 94b, and stamp icon 94c, on coincidence as an icon 94. If it points to the location where the icon 94 is displayed like the icon 94 if these icons 94 are displayed with a finger etc., since the coordinate input unit 3 will detect the coordinate of the location and it will click on an icon 94, various actuation is attained.

[0135] for example, the icon of the function in which Rhine tool icon 94a is the icon of the function which draws Rhine on screen 2a, and eraser icon 94b eliminates the image on screen 2a in the example of an icon 94 shown in drawing 22 -- it is -- stamp icon 94c -- "secrecy" -- it is the icon of the function which displays which "secret" alphabetic character and "secret" mark on screen 2a. If it explains more concretely, by clicking Rhine tool icon 94a, the coordinate input unit 3 can detect the locus which traced the screen 2a top with the finger etc., and Rhine can be displayed on the locus. Moreover, by clicking eraser icon 94b, the coordinate input unit 3 can detect the locus which traced the screen 2a top with the finger etc., and the image on the locus can be eliminated. furthermore, the location directed with the finger on screen 2a etc. by clicking stamp icon 94c -- "secrecy" -- which "secret" alphabetic character and "secret" mark can be displayed.

[0136] Thus, since the predetermined icon 94 can be displayed on the location where it is beforehand set up near the point Pb by pointing to two points and Points Pa and Pb to coincidence with a finger etc. Compromise to the location where the desired icon 94 is displayed, or [ lengthening the limbs greatly one by one, in order that User M may click on an icon 94 ] or -- starting specially, whenever it clicks on an icon 94, in sitting on a chair and operating it \*\*\*\*\* -- etc. -- even if it does not perform troublesome actuation, an icon 94 can be displayed at hand and operability can be improved.

[0137] In order to display an icon 94, only when it points to two points of screen 2a to coincidence with a finger etc., (Y of step S1, Y of S2, Y of S4), The case where the locus traced with the finger etc. by the function of Rhine tool icon 94a is indicated by Rhine since an icon 94 is displayed (step S7), It is easily



distinguished from the case where it points to one on screen 2a, like [ in the case of eliminating the image on the locus traced with the finger etc. by the function of eraser icon 94b ].

[0138] Moreover, if a certain amount of time amount is vacated and it is made to point to two on screen 2a, since an icon 94 is displayed, the case where place the extent time difference which is the purpose of an except, and it points to two points is distinguishable, since it is necessary to point to two points and Points Pa and Pb within fixed time amount T at coincidence (N of step S3).

[0139] Furthermore, if distance d is set as the distance usually considered that it may point with two fingers of one hand, since an icon 94 is displayed, the case where keep the extent distance which is the purpose of an except and it points to two points is distinguishable, since an icon 94 is not displayed unless the distance during Points Pa and Pb is below the distance d (Y of step S6).

[0140] In addition, the class of icon displayed as an icon 94 and a number, a display position (the exception of the location on the basis of any of Points Pa and Pb, Point Pa or the distance from Pb, a direction, range), etc. can be beforehand set up on the actuation screen displayed on screen 2a. This realizes a reception means and reception processing. And if this setup is made, the contents of the aforementioned predetermined table will be updated in the class of icon 94 after a setup and a number, and a display position, and an icon 94 will be henceforth displayed according to those contents. This realizes an updating means and an update process.

[0141] In this case, these items can also be registered into a table for every user according to individual. And discernment of each user can be performed using various authentication techniques. For example, or it inputs a user's name and ID on screen 2a (or it chooses), it is reading a user's fingerprint and collating this with a registered fingerprint beforehand etc. (for details, see a JP,2000-187419,A official report, the JP,2000-187420,A official report, etc., for example). Furthermore, when Points Pa and Pb are in the upper limit side on screen 2a, an icon 94 is displayed on the bottom, when it is in a lower limit side at the bottom, and when Points Pa and Pb are in the right end side on screen 2a, an icon 94 can be displayed on left-hand side on right-hand side, when it is in a left end side.

[0142] When it points to three or more on screen 2a, you may make it display an icon 94, although he is trying to display an icon 94 in the aforementioned example when it points to two points of Points Pa and Pb on screen 2a. In this case, you may make it change the class of icon 94 to display by to what point it pointed. By this, when it points to two points for example, on screen 2a, the highest icon 94 of operating frequency is displayed for a user. it is alike, and since it follows, the thing whose it increases with three points and four points and for which the icon 94 with low operating frequency is displayed one by one becomes possible, the class of icon 94 which carries out a finger and comes out of and which can be displayed is increased and the display can be changed easily, operability can be raised further.

[0143] By the way, in order to perform such processing, it is necessary to enable it to detect to coincidence the coordinate of two points (points Pa and Pb) to which it pointed on screen 2a. Then, the technique for detecting the coordinate of Points Pa and Pb to coincidence is also explained using the coordinate input unit 3 mentioned above.

[0144] That is, when coordinate input unit 3A of a recursive light electric shielding method was explained to the example and the directions members A and B are inserted into information input area 3a at coincidence as shown in drawing 23, the field (scotoma) where the optical reinforcement of two places is weak is because it is generated, respectively on CCD (photo detector)39 of the optical unit 27 (left-hand side optical unit 27L, right-hand side optical unit 27R). that is, since the position coordinate was computed as a function of  $X_n L X_n R$  as mentioned above, when two directions members A and B are inserted into information input area 3a at coincidence While the include angle  $\theta_{R2}$  of an include angle  $\theta_{R1}$ , and the directions member B and right-hand side optical unit 27R of the directions member A and right-hand side optical unit 27R to make to make is computed The include angle  $\theta_{L2}$  of an include angle  $\theta_{L1}$ , and the directions member B and left-hand side optical unit 27L of the directions member A and left-hand side optical unit 27L to make to make will be computed, and a total of four position coordinates will be computed.

[0145] However, even if it is the case where a total of four position coordinates are computed by two directions members in this way by the inside of information input area 3a having been directed to

coincidence, it is possible to detect the position coordinate directed by two directions members. Real-image judging processing in which the position coordinate of the actual covering point (reflective spot) by two or more directions members is judged out of two or more position coordinates computed below is explained.

[0146] The flow chart which shows roughly the flow of the processing in which drawing 24 includes real-image judging processing here, and drawing 25 are the explanatory views showing the condition that two or more position coordinates which can be set to information input unit 3A are computed. In addition, in drawing 21, the coordinate locus of a real image which directed "A1, A2, A3, A4" by one directions member, and "B1, B2, B3, B4" show the coordinate locus of the real image directed by the directions member of another side. Moreover, "C1, C2, C3, C4", and "D1, D2, D3, D4" are virtual images.

[0147] In the gestalt of this operation, calculation of a coordinate judges first whether a calculation coordinate is five or more (step S14 shown in drawing 24). Since directions members, such as (Y of step S14 shown in drawing 24), three or more fingers, and Penn, are inserted into information input area 3a at coincidence when a calculation coordinate is five or more, future decision is not performed.

[0148] On the other hand, when a calculation coordinate is not five or more, in continuing step S15, it is judged from the directions member inserted into (N of step S14 shown in drawing 24) information input area 3a being one or two whether the number of calculation coordinates is one.

[0149] For example, since the number of calculation coordinates is not one when two directions members are inserted into information input area 3a at coincidence and four position coordinates (A1, B1, C1, D1 which are shown in drawing 25) are computed (N of step S15), coordinate extract processing in which the position coordinate of the actual covering point by two or more directions members is extracted out of two or more position coordinates is performed. In addition, although not illustrated especially, when 1 receives optical unit 27 when two directions members are inserted into information input area 3a at coincidence and the insertion point is located in a line on a straight line, the number of the position coordinates computed is two.

[0150] As coordinate extract processing, two or more computed position coordinates (A1, B1, C1, D1) are first memorized in the memory of RAM14 grade (step S16).

[0151] In continuing step S17, it is judged whether there is any position coordinate decided as a real image among two or more position coordinates (A1, B1, C1, D1) recorded on memory.

[0152] When there is no position coordinate decided as a real image, it progresses to (N of step S17), and step S18, and it judges whether the calculation coordinate required for a real-image judging for multiple times acquired one by one serially is memorized by memory.

[0153] When the calculation coordinate for multiple times is memorized by memory, after setting up the initial criteria (experimental value) of (Y of step S18) vector length, displacement length, and the displacement direction (step S19), it progresses to step S20 and real-image judging processing is performed.

[0154] Here, drawing 26 is a flow chart which shows the flow of real-image judging processing roughly. As shown in drawing 26, first, in step S51, real-image judging processing makes a predetermined calculation coordinate an origin coordinate, computes the coordinate vector value and coordinate vector length between coordinates, and memorizes them in the memory of RAM14 grade for every sampled position coordinate.

[0155] Here, the calculation approach of a coordinate vector value is explained with reference to drawing 27. In drawing 27, the position coordinate which was able to acquire the position coordinate detected last time (X1, Y1), and this time is set to (X2, Y2). A coordinate vector value is computed by  $\Delta Y / \Delta X$  from variation  $\Delta X = X2 - X1$  of the direction of X coordinate, and variation  $\Delta Y = Y2 - Y1$  of the direction of Y coordinate. From X shaft orientations, the coordinate vector value in this case is evaluated at intervals of 10 degrees by the vector table TB stored in RAM42 shown in drawing 28, and is beforehand stored in it. In addition, what is necessary is just to set this spacing (10 degrees) as arbitration. Moreover, the approximate value of a calculation result shall be used for a coordinate vector value. For example, it will be set to coordinate vector value =24 if it is the case of

$\Delta Y/\Delta X = 0.900$  in  $-\Delta Y$  and  $-\Delta X$ .

[0156] Moreover, if the coordinate vector value between the coordinates in each sampling is computed as mentioned above as drawing 27 is shown, and the coordinate vector length  $L$  between each coordinate is a coordinate  $(X1, Y1)$  and the coordinate vector length  $L1$  of a between  $(X2, Y2)$ , it is  $L1 = \sqrt{(Y2 - Y1)^2 + (X2 - X1)^2}$ .

It is alike and is computed more. Thus, the coordinate vector value and its coordinate vector length are computed for every sampled position coordinate, respectively.

[0157] That is, in step S51, processing formed into a vector coordinate using the vector data by which setting storing is carried out beforehand to a vector table TB about the length which indicates a part for the change to be the direction where it changes between the position coordinates acquired one by one serially is performed.

[0158] Then, it progresses to step S52 and it is judged whether the coordinate vector length which computed at step S51 is unusual coordinate vector length (abnormality vector length) which cannot move in a coordinate detection period (predetermined time interval accompanying a sampling signal). In addition, the coordinate detection period in the gestalt of this operation is set to 20ms. That is, since step S52 cannot be moved in fact when the coordinate vector length which computed at step S51 is longer than the die length detected in a coordinate detection period (20ms), the coordinate locus judges it to be what is unusual coordinate vector length (abnormality vector length), and is not a real-image locus.

[0159] When coordinate vector length is abnormality vector length, (Y of step S52), Progress to step S53 and it is judged whether the number of position coordinates as which the number of the coordinate vector length which judged abnormality vector length was detected was reached. If the detected number of position coordinates is not reached (N of step S53), a terminal position coordinate is changed (step S54), and the coordinate vector value based on the terminal point and coordinate vector length are again computed in step S51.

[0160] That is, processing of steps S51-S52 is repeated until it is judged with coordinate vector length not being abnormality vector length (N of step S52), or until it is judged with the coordinate vector length about the position coordinate of all terminal points being abnormality vector length (Y of step S53).

[0161] If the case where followed, for example, a position coordinate A1 is made into an origin coordinate is explained The position coordinate computed just behind that as shown in drawing 25 from it being A2, B-2, and C2 and D2 One position coordinate is chosen at a time as a terminal point from these position coordinates (A2, B-2, C2, D2). Sequential calculation of any of A1 → A2, A1 → B-2, A1 → C2, and A1 → D2, the coordinate vector value (origin vector value) concerning one, and its coordinate vector length (origin vector length) will be carried out, and the sequential judging of whether it is a real-image locus will be carried out.

[0162] In addition, since (Y of step S53) and decision of a real image can be performed when judged with the coordinate vector length about the position coordinate of all terminal points being abnormality vector length, it progresses to step S21 mentioned later.

[0163] On the other hand, when judged with coordinate vector length not being abnormality vector length, (N of step S52) and the position coordinate of the terminal point are memorized in the memory of RAM14 grade (step S55), and predetermined initialization ( $n = 3$  ( $n$ : count of a coordinate detection period)) is performed (step S56).

[0164] In continuing step S57, the position coordinate of the terminal point of the origin vector memorized in memory in step S55 is made into an origin coordinate, the coordinate vector value and coordinate vector length between coordinates with the position coordinate detected in the  $n$ -th coordinate detection period are computed, and it memorizes in the memory of RAM14 grade.

[0165] Then, it progresses to step S58 and the coordinate vector length which computed at step S57 judges whether it is the unusual coordinate vector length (abnormality vector length) which cannot move in a coordinate detection period.

[0166] When judged with coordinate vector length not being abnormality vector length, (N of step S58), It progresses to step S59 and the coordinate locus of A1 → A2 and the coordinate locus of A2 → A3

which should be a real-image locus are compared, a coordinate vector value is in the specific amount of displacement (V), and coordinate vector length judges whether it is the locus (abnormalities a variation rate merit) which is outside the specific amount of displacement (L).

[0167] Thus, a coordinate vector value being in the specific amount of displacement (V), and judging whether it is the locus (abnormalities a variation rate merit) which is outside the amount of displacement of specification [ coordinate vector length ] (L) As shown in drawing 29 , in drawing a straight line generally Although a coordinate vector value changes when drawing a curve, although the coordinate vector length within a coordinate vector value and the same time amount is almost the same and not being illustrated especially, variation is abbreviation identitas and originates in coordinate vector length serving as abbreviation identitas. That is, when a detection object moves onto a straight line or a curve, since it is not generated, the big difference to coordinate vector length and a coordinate vector value is eliminated about the locus (abnormalities a variation rate merit) which is outside the amount of displacement of specification [ coordinate vector length ] (L), even if a coordinate vector value is in the specific amount of displacement (V).

[0168] abnormalities -- a variation rate -- the coordinate locus of A1 ->A2 and the coordinate locus of A2 ->A3 which it should progress to (N of step S59), and step S60, and should be a real-image locus when judged with his not being merit -- comparing -- the variation rate of specification [ a coordinate vector value ] -- it judges whether it is the locus (abnormalities a variation rate direction) on which it is out of an amount (V), and coordinate vector length is decreasing.

[0169] Thus, judging whether it is the locus (abnormalities a variation rate direction) on which a coordinate vector value is out of the specific amount of displacement (V), and coordinate vector length is decreasing As shown in drawing 30 , in changing the direction of a straight line a lot and drawing it generally Since the writing speed to turn will carry out sequential reduction, will be in a idle state in the direction commutation point and will begin to be again drawn in the conversion direction at the rate of usual, when a coordinate vector value changes a lot, coordinate vector length originates in increasing toward the conversion direction, after decreasing serially. That is, when a detection object changes a direction a lot, since a idle state of operation occurs just before, even if coordinate vector length is decreasing, it eliminates about the locus (abnormalities a variation rate direction) whose coordinate vector value is outside the specific amount of displacement (V).

[0170] abnormalities -- a variation rate -- if it puts in another way when judged with it not being a direction (N of step S60) -- abnormality vector length -- abnormalities -- a variation rate -- merit -- abnormalities -- a variation rate -- the case where it is not a direction, either -- the position coordinate of the terminal point -- the memory of RAM14 grade -- memorizing (step S61) -- the count n of a coordinate detection period -- "1" -- it increments (step S62).

[0171] Then, it is judged whether in step S63, the number of the calculation coordinates for multiple times (judgment coordinate number) which needs the count n of a coordinate detection period for the real-image judging memorized by memory and which is obtained one by one serially was exceeded. When the count n of a coordinate detection period is not over the judgment coordinate number, (Y of step S63) and the continuation vector mentioned above are made into an origin vector (step S64), and in step S57, the coordinate vector value based on the terminal point and coordinate vector length are computed again.

[0172] That is, a terminal position coordinate is changed (step S66), and processing of steps S57-S64 is repeated until the position coordinate of all terminal points is judged with their being abnormality vector length, abnormality displacement length, or the abnormality displacement direction (Y of step S65).

[0173] and -- the position coordinate of all terminal points -- abnormality vector length or abnormalities -- a variation rate -- merit or abnormalities -- a variation rate -- when judged with it being a direction, (Y of step S65), the coordinate vector value based on [ in / progress to step S54 again, change a terminal position coordinate, and / step S51 ] the terminal point, and coordinate vector length are computed.

[0174] The position coordinate of the terminal point of the origin vector which followed, for example, was memorized in memory in step S55 is A2. When A1 ->A2 shall be a real-image locus, the position coordinate computed just behind that as shown in drawing 25 from it being A3, and B3, C3 and D3 One

position coordinate is chosen at a time as a terminal point from these position coordinates (A2, B-2, C2, D2). Sequential calculation of any of A2 →A3, A2 →B3, A2 →C3, and A2 →D3, the coordinate vector value (continuation vector value) concerning one, and its coordinate vector length (continuation vector length) will be carried out, and the sequential judging of whether it is a real-image locus will be carried out.

[0175] Since it means that (Y of step S63) and a real image were decided on the other hand when judged with the count n of a coordinate detection period having exceeded the judgment coordinate number, the position coordinate will be transmitted to a computer 5 through an interface 43 (step S67), and it will use for processing of the display of the directions location by the directions member, the command input corresponding to a directions location, etc.

[0176] Here, the judgment of being a real image about other position coordinates based on the position coordinate of 1 is explained with reference to drawing 23 . If each A and A' of the judgment of being a real image about other position coordinates based on the position coordinate of 1 shall be a real image in drawing 23 , a coordinate will be detected in the direction of \*\*. For this reason, it turns out that either of A and A' is a real image. Moreover, it turns out similarly that either of B and B' is a real image. That is, only either of the position coordinate which exists in the same direction is a real image, and another side will be a virtual image. Moreover, since B' of the \*\* direction will also be recognized as a virtual image while A' of another side is recognized as a virtual image when it turns out that one A is a real image, it turns out that B is a real image. That is, if a real image or a virtual image is recognized about the position coordinate of one among four position coordinates memorized by memory, it turns out that the judgment of the real image about all position coordinates or a virtual image is possible. Therefore, since it is necessary to perform a real-image judging about no computed position coordinates, it becomes possible to detect the position coordinate at the time of directing two or more places to coincidence by low cost.

[0177] In addition, as shown in drawing 31 , when the position coordinate (it sets to drawing 31 and is B1) of one exists out of information input area 3a among two or more position coordinates (A1, B1, C1, D1) memorized by memory, A1 and C1 can be decided as a real image.

[0178] That is, if a real image or a virtual image is recognized about the position coordinate of one among four position coordinates memorized by memory, according to the judgment of the real image about all position coordinates or a virtual image being possible, it will decide as a real image (step S68), and the position coordinate of another side will also be transmitted to a computer 5 through an interface 43 (step S69). Moreover, processing of steps S67-S69 is repeated until it decides about all judgment coordinate numbers (Y of step S70). And when transmission of the position coordinate of the real image about all judgment coordinate numbers is completed, it ends and (Y of step S70) and real-image judging processing return to step S14.

[0179] Next, the processing at the time of being judged with the coordinate vector length about the position coordinate of all terminal points being abnormality vector length in step S53 is explained. Although it progresses to step S21 as (Y of step S53), and a thing which cannot perform decision of a real image as mentioned above when judged with the coordinate vector length about the position coordinate of all terminal points being abnormality vector length, in this step S21, it judges whether there is any paddle which is still performing real-image judging processing about the position coordinate (for example, C1 [ on drawing 25 and as opposed to A1 ]) of the same direction. When real-image judging processing about the position coordinate of the same direction has not been performed yet, (N of step S21) and an origin coordinate are changed (step S22), and it progresses to step S20 again, and real-image judging processing is performed. On the other hand, when real-image judging processing about the position coordinate of the same direction is being performed, (Y of step S21) and the criteria of the vector length, displacement length, and the displacement direction set up at step S19 are changed (step S23), it progresses to step S20 again, and real-image judging processing is performed. That is, a real-image judging will be repeated on these conditions by turns about the position coordinate of two points of the same direction.

[0180] Moreover, when the number of the computed position coordinates is one, while transmitting (Y



of step S15), and its computed position coordinate to a computer 5 through an interface 43 (step S24), it memorizes in the memory of RAM14 grade (step S25), and returns to step S14.

[0181] Next, in step S17, the case where it is judged with there being a position coordinate decided as a real image is explained. When there is a position coordinate decided as a real image, it progresses to (Y of step S17), and step S26.

[0182] The case where there is a position coordinate decided as a real image here is a case where two or more storage of the position coordinate in case the position coordinate computed as mentioned above is not plurality is carried out at the memory of RAM14 grade, for example, is a case as shown in drawing 32. As the directions member of 1 has described drawing 32, it shows the condition that other directions members were inserted into information input area 3a. In addition, the case where there is a position coordinate decided as a real image cannot be overemphasized by including the case where the coordinate of two points is decided by processing which was mentioned above.

[0183] In step S26, based on the last time of the position coordinate decided as a real image, and the value before last, the coordinate vector value (real-image vector value) and coordinate vector length (real-image vector length) between coordinates are computed, and it memorizes in the memory of RAM14 grade.

[0184] then, vector length and a variation rate -- merit and a variation rate -- after setting up the initial criteria (experimental value) of a direction (step S27), the position coordinate of the terminal point of the real-image vector memorized in memory in step S26 is made into an origin coordinate, the coordinate vector value and coordinate vector length between coordinates with the position coordinate detected by coincidence are computed, and it memorizes in the memory of RAM14 grade. [ two or more ]

[0185] Then, it progresses to step S29 and the coordinate vector length which computed at step S28 judges whether it is the unusual coordinate vector length (abnormality vector length) which cannot move in a coordinate detection period.

[0186] When judged with coordinate vector length not being abnormality vector length, (N of step S29), It progresses to step S30 and the coordinate locus of A3->A4 and the coordinate locus of for example, A4->A which should be a real-image locus are compared, a coordinate vector value is in the specific amount of displacement (V), and coordinate vector length judges whether it is the locus (abnormalities a variation rate merit) which is outside the specific amount of displacement (L).

[0187] abnormalities -- a variation rate -- the coordinate locus of A3->A4 and the coordinate locus of for example, A4->A which it should progress to (N of step S30), and step S31, and should be a real-image locus when judged with his not being merit -- comparing -- the variation rate of specification [ a coordinate vector value ] -- it judges whether it is the locus (abnormalities a variation rate direction) on which it is out of an amount (V), and coordinate vector length is decreasing.

[0188] abnormalities -- a variation rate -- if it puts in another way when judged with it not being a direction (N of step S31) -- abnormality vector length -- abnormalities -- a variation rate -- merit -- abnormalities -- a variation rate, in not being a direction, either The position coordinate of the terminal point is memorized in the memory of RAM14 grade (step S32). While transmitting the position coordinate to a computer 5 through an interface 43 (step S33), it decides as a real image (step S34), and the position coordinate of another side is also transmitted to a computer 5 through an interface 43 (step S35).

[0189] the case (Y of step S29) where it is judged with coordinate vector length being abnormality vector length on the other hand -- abnormalities -- a variation rate -- the case (Y of step S30) where it is judged with his being merit -- abnormalities -- a variation rate -- a detection coordinate is changed (step S37) and processing of steps S28-S31 is repeated until it reaches (Y of step S31), and a detection coordinate number (Y of step S36), when judged with it being a direction.

[0190] Therefore, when [ for example, ] the position coordinate of the terminal point of the real-image vector memorized in memory in step S26 is A4, The position coordinate computed just behind that as shown in drawing 32 from their being A, B, C, and D One position coordinate is chosen at a time as a terminal point from these position coordinates (A, B, C, D). Sequential calculation of A4->A, A4->B, A4->C, any of A4->D or the coordinate vector value (locus vector value) concerning one, and its



coordinate vector length (locus vector length) will be carried out, and the sequential judging of whether it is a real-image locus will be carried out. That is, other position coordinates located in the same direction to a photo detector in pursuing the locus of the position coordinate of 1 judged that is a real image are recognized to be a virtual image, and the position coordinate which are other real images is decided.

[0191] Moreover, when a detection coordinate number is reached, (Y of step S36) and the criteria of the vector length, displacement length, and the displacement direction set up at step S27 are changed (step S38), and it progresses to step S28 again, and a coordinate vector value (locus vector value) and its coordinate vector length (locus vector length) are computed.

[0192] Even if it is the case where a total of four position coordinates are computed by two directions members by the above processings by the inside of information input area 3a having been directed to coincidence, the position coordinate directed by two directions members can be detected, and these two position coordinates can be confirmed.

[0193] Next, another example of the actuation image displayed on screen 2a is explained.

[0194] First, as shown in drawing 33, when it points to coincidence to three on screen 2a, the dial 101 which is an actuation image is displayed on the location where it is beforehand set up near [ the ] the three points ( drawing 33 (a)). The image of this dial 101 is beforehand contained in the drawing software of a hard disk 17. And the location of three points which is pointing on screen 2a is moved, if actuation of turning a dial 101 is carried out, the image of a dial 101 can also be rotated and rotation actuation of the dial 101 can be carried out ( drawing 33 (b)). This dial 101 is carrying out rotation actuation, and makes it possible to perform predetermined actuation to the information input/output system 1. It is suitable for gradual or stepless adjustment of fixed physical quantity, such as adjustment of the voice volume in the case of outputting voice with the information input/output system 1 in this example, since an actuation image is a dial, etc.

[0195] Processing about this dial 101 is specifically performed as follows. Drawing 34 is a flow chart explaining the processing in this case. First, it detects that coincidence points to three on screen 2a (Y of step S71). Although the coordinate of three or more points to which it pointed on screen 2a is undetectable to coincidence in the processing explained below with reference to drawing 23, it cannot be necessary to specify that exact coordinate of three points in this example that what is necessary is just to be able to detect that coincidence points to three on screen 2a. That is, since a total of nine points of the real image of three points and the virtual image of six points are detected also in the example below drawing 23 when pointing to three on screen 2a, thereby, it is detectable that actually pointing is three points (even if the exact location of three points is undetectable).

[0196] In the example of drawing 35, 6 point G1-G6 of three-point Pa of a real image, Pb and Pc, and a virtual image are detected. And the coordinate of the middle point C of each of these coordinates Pa (xa, ya), Pb (xb, yb), Pc (xc, yc), G1 (x1, y1)-G6 (x6, y6) of nine points is searched for (step S72).

[0197] namely, --  $x0 = (xa + xb + xc + x1 + x2 + x3 + x4 + x5 + x6) / 9$   $y0 = (ya + yb + yc + y1 + y2 + y3 + y4 + y5 + y6) / 9$  .... (6)

\*\*\*\*\* is performed and the coordinate (x0, y0) of the middle point C is searched for.

[0198] And the image of a dial 101 is displayed centering on the location of this middle point C (x0, y0) (step S73).

[0199] And when there is migration of a location, as it is shown in (Y of step S74), and drawing 36 nine-point Pa-Pc and in G1-G6 One point is specified as an observing point nine-point Pa-Pc and in G1-G6 (this example the point Pa), and the nearest detecting point is made into the moving point of an observing point at an observing point in the case of migration of a location (in this example, it displays as point Pa'). The middle point C as a core of a circle Angle-of-rotation  $\theta_{tam}$  of the circle concerned is computed from the observing point Pa (xa, ya) and two points of moving point Pa' (xa', ya') (step S75). Step S74 has realized a migration detection means and migration detection processing.

[0200] That is, migration length  $L = \sqrt{(xa' - xa)^2 + (ya' - ya)^2}$  radius  $r = \sqrt{(xa - x0)^2 + (ya - y0)^2}$  are calculated (also see drawing 37), and it is angle-of-rotation  $\theta_{tam} = (360 \times L) / (2 \times \text{pixr})$  from this result. (However, pi circular constant)

\*\*\*\*\*.

[0201] And according to angle-of-rotation  $\theta$ , the image of a dial 101 is rotated and displayed centering on the middle point C (step S76). Steps S73, S75, and S76 have realized an actuation image display means and actuation image display processing. Moreover, actuation according to angle-of-rotation  $\theta$  is received and performed (step S77). Step S77 has realized an actuation means and actuation processing. That is, when a dial 101 operates voice volume as mentioned above, voice volume will be operated according to the magnitude of angle-of-rotation  $\theta$ . When no longer pointing to three on screen 2a, (Y of step S78) and the display of a dial 101 are eliminated (step S79).

[0202] Another example of the actuation image displayed on screen 2a is explained.

[0203] As shown in drawing 38, when it points to coincidence to five on screen 2a with five fingers of one hand etc., a door 102 is displayed on the location where it is beforehand set up near [ the ] the five points ( drawing 38 (a)). And if the location of five points to which it pointed as it was is moved below (or upper part), a door 102 will open gradually with migration of the location of five points, and the pallet 103 which is an actuation image will appear under a door 102 ( drawing 38 (b)). The image of a door 102 and a pallet 103 is beforehand contained in the drawing software of a hard disk 17. And various actuation can be inputted on a pallet 103 by pointing to one point from which a user differs on a pallet 103, respectively one by one. Since a door 102 is displayed and the pallet 103 which is an actuation image is first displayed on the bottom of a door 102 after that in this example, it is suitable when displaying the actuation image for performing the actuation image which you want to display immediately only by pointing to a screen 2a top, for example, the input which changes a initial value.

[0204] Processing about this pallet 103 is specifically performed as follows. Drawing 39 is a flow chart explaining the processing in this case. First, it detects that coincidence points to five on screen 2a (Y of step S81). Since a total of 25 points of the real image of five points and the virtual image of 20 points are detected when it cannot be necessary to specify the exact coordinate of five points and points to five on screen 2a also in this example, thereby, it is detectable that actually pointing is five points.

[0205] And the same operation as (6) is performed also here, and the coordinate ( $x_0, y_0$ ) of the middle point C of a total of 25 points is searched for (step S82). (refer to drawing 40 ) And the image of a door 102 is displayed on screen 2a centering on the middle point C (step S83). Step S83 has realized a door display means and door display processing.

[0206] Then, although (Y of step S84) and the location of the middle point C are also caudad moved when the location of five points to which the user is pointing is dragged caudad as it was and there is migration of the location of five points, it is not necessarily in agreement with the drag direction. Step S84 has realized a migration detection means and migration detection processing. Since the thing which is the need is the migration length to a lower part, if it sets the coordinate of C point after moving the coordinate of C point before migration ( $x_0, y_0$ ) to ( $x_1, y_1$ ) By " $l=y_1-y_0$ ", the migration length  $l$  to a lower part is found (refer to drawing 41 ) (step S85), and the image of a door 102 is lowered and displayed only for the migration length  $l$  minutes, and a pallet 103 is displayed on the location of the first door 102 (step S86). Step S86 has realized a door modification means, door modification processing, an actuation image display means, and actuation image display processing. It is made for the display of this pallet 103 to be whether a pallet 103 appears gradually from under a door 102 by displaying only the location of a door 102, and the image of a part with which it is not covered.

[0207] And when actuation of a pallet 103 is made, (Y of step S87) and its actuation (for example, as mentioned above modification of a initial value) are received and performed (step S88), and when termination of a display of a pallet 103 is directed on a pallet 103, the display of (Y of step S89), a door 102, and a pallet 103 is ended (step S90). Step S88 has realized an actuation means and actuation processing.

[0208] Another example of the actuation image displayed on screen 2a is explained.

[0209] As shown in drawing 42, it is not simultaneous on screen 2a, and when it points to three points to coincidence one by one, the pallet 104 which is an actuation image is displayed on the location where it is beforehand set up near [ the ] the three points. The image of a pallet 104 is contained in the drawing software stored in the hard disk 17. In this case, a pallet 103 does not appear gradually with the drag of a

door 102 like the above-mentioned example, but since a pallet 104 is what is displayed immediately, it is suitable for the display of the actuation image which you want to display immediately only by pointing to a screen 2a top.

[0210] As shown in drawing 43 , after the processing in this case detects one point (point A) (Y of step S91) (refer to drawing 44 ), One another point (point B) is detected in predetermined time, with this one point maintained (Y of step (refer to drawing 45 ) S92). Furthermore, if one point (point C) of an exception is detected, with these two points maintained (Y of step S93) (refer to drawing 46 ), a pallet 104 will be displayed on the location where it is beforehand set up near these three points (step S94). Step S94 has realized an actuation image display means and actuation image display processing.

[0211] In this case, since it can also perform easily detecting the exact coordinate of three points (points A, B, and C), you may make it determine the display position of a pallet 104 from that exact coordinate of three points, although it may ask for the middle point of the real image of three points, and the virtual image of six points like the above-mentioned and a pallet 104 may be displayed on the location of the predetermined direction of the middle point concerned, and predetermined distance.

[0212] That is, although Points A, B, C, and D will be detected if Point B is directed with the point A directed as shown in drawing 45 , it turns out from the beginning that an A point is a real image ( drawing 44 ). Since Points B and D should not be detected supposing Point C is the real image of the 2nd point, and Points B and C should not be detected supposing Point D is the real image of the 2nd point, a B point is judged to be the real image of the 2nd point. Next, since Points I, F, D, C, and E will not be detected if Point H is the real image of the 3rd point supposing Points A and B are decided as shown in drawing 46 , Point H is judged to be a virtual image. The same decision is repeated and it is judged with Points A, B, and C being real images.

[0213] After the display (step S94) of a pallet 104, when actuation of a pallet 104 is made, (Y of step S95) and its actuation (for example, as mentioned above modification of a initial value) are received and performed (step S96), and when termination of a display of a pallet 104 is directed on a pallet 104, (Y of step S97) and the display of a pallet 104 are ended (step S98).

[0214] Another example of the actuation image displayed on screen 2a is explained.

[0215] If it points to one point (point Pa) on screen 2a, it points to the 2nd (point Pb) point in this condition and this location of the 2nd point is moved up and down as shown in drawing 47 , the slider bar 105 which is an actuation image will be displayed on the location of the 2nd point to which it is pointing. The image of a slider bar 105 is contained in the drawing software in a hard disk 17. This slider bar 105 as well as the case of a dial 101 is suitable for gradual or stepless adjustment of fixed physical quantity, such as adjustment of the voice volume in the case of outputting voice with the information input/output system 1, etc.

[0216] As shown in drawing 48 , after the processing in this case detects one point (point A) (Y of step S101) (refer to drawing 49 ), One another point (point B) is detected in predetermined time, with this one point maintained (Y of step S102). Then, when migration of the 2nd (point B) point is detected with the first directions of one point (point A) maintained, it carries out by displaying the image of a slider bar 105 on (Y of step S103), and the location of the 2nd (point B) point (step S104). Step S103 realizes a migration detection means and migration detection processing, and step S104 has realized an actuation image display means and actuation image display processing.

[0217] Detection of the exact coordinate location of Points A and B can be performed using the technique mentioned above below with reference to drawing 23 . Thereby, it can judge with Points A and B being real images among point A-D. and the time of the location of Point B moving -- the coordinate (refer to drawing 49 (x0, y0)) of the location of the original point B -- the coordinate of the location of the point B after migration -- \*\* (refer to drawing 50 (x1, y1)), if it carries out By " $l=y1-y0$ ", since vertical migration length can be found, the image of a slider bar 105 can be displayed on the location which only distance l moved perpendicularly.

[0218] And actuation (adjustment of voice volume etc.) according to the distance l which moved is received and performed (step S105). Step S105 has realized an actuation means and actuation processing. Then, when detection of the two-point coincidence of Points A and B is no longer made, (Y

of step S106) and the display of a slider bar 105 are eliminated (step S107).

[0219] In the above, the example of various actuation images was explained. Next, the processing for judging the exception of these actuation images and displaying a suitable actuation image according to the directions on screen 2a, is explained.

[0220] As shown in drawing 51, sequential detection of the two points is carried out on screen 2a (Y of step S111), when moving one point detected behind, it shifts to the processing described above with reference to (Y of step S112), and drawing 48 (step S113), and a slider bar 105 (refer to drawing 47) is displayed. In this case, when there is no migration of one point detected behind, it shifts to the processing described above with reference to (N of step S112), and drawing 20 (step S114), and an icon 94 (refer to drawing 22) is displayed.

[0221] Also when two points are detected to coincidence on screen 2a, it shifts to the processing described above with reference to (Y of step S115), and drawing 20 (step S114), and an icon 94 (refer to drawing 22) is displayed.

[0222] When sequential detection of the three points is carried out on screen 2a, it shifts to the processing described above with reference to (Y of step S116), and drawing 43 (step S117), and a pallet 104 is displayed (refer to drawing 42).

[0223] When three points are detected to coincidence on screen 2a, it shifts to the processing described above with reference to (Y of step S118), and drawing 34 (step S119), and a dial 101 is displayed (refer to drawing 33).

[0224] When five points are detected to coincidence on screen 2a, it shifts to the processing described above with reference to (Y of step S120), and drawing 39 (step S121), and a pallet 103 is displayed (refer to drawing 38). Processing of steps S111-S121 has realized an actuation image display means and actuation image display processing.

[0225] Below, the example of a display of other actuation images is explained briefly.

[0226] As shown in drawing 52, when it points to two points (points A and B) one by one on screen 2a So that the predetermined object 106 which is an actuation image is displayed, and the distance of these points A and B may be expanded and it may be made to reduce in those two points When moving the location of Points A and B, it responds to the magnitude of the migration length, and it expands and reduces and you may make it display the magnitude of an object 106. An object 106 is the icon 94 mentioned above.

[0227] Drawing 53 is a flow chart in this case. Namely, after detecting one point (point A) (Y of step S131), One another point (point B) is detected in predetermined time, with this one point maintained (Y of step S132). When Points A and B are moved, (Y of step S133) and an object 106 are displayed (step S134). Then, the distance la of the beginning of Point A and Point B, A difference with the distance lb after migration is searched for, the range difference lc of the distance la and distance lb is searched for (step S135), and it responds to the magnitude of the range difference lc, and an object 106 is expanded and it reduces (step S136). By step S133, S134 realizes an actuation image display means and actuation image display processing, and step S136 has realized an enlarging-or-contracting means and enlarging-or-contracting processing for a migration detection means and migration detection processing.

[0228] As shown in drawing 54, when others and three points (points B, C, and D) are detected to coincidence, maintaining this detection of one point after detection of one point (point A), you may make it display a pallet 104, although he is trying to display a pallet 104 in the example mentioned above with reference to drawing 42 - drawing 46 when sequential detection of the points A, B, and C is carried out.

[0229] Furthermore, although a slider bar 105 is displayed on Point B and he is trying for a slider bar 105 to move with migration of Point B in the example mentioned above with reference to drawing 47 - drawing 50, a slider bar 105 is displayed ranging over Points A and B, and you may make it a slider bar 105 move with vertical migration of Points A and B, as shown in drawing 55.

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[Translation done.]

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- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the appearance perspective view showing roughly the information input/output system which is one gestalt of operation of this invention.

[Drawing 2] It is the block diagram showing the electrical installation of each part built in information input/output system.

[Drawing 3] It is the block diagram showing the electrical installation of each part built in a computer.

[Drawing 4] It is the explanatory view showing the configuration of the 1st coordinate input unit roughly.

[Drawing 5] It is the block diagram showing the structure of an optical unit roughly.

[Drawing 6] It is the block block diagram of a controller.

[Drawing 7] It is the front view showing an example which pointed by the directions member to one in the information input area in the 1st coordinate input unit.

[Drawing 8] It is the explanatory view showing detection actuation of CCD typically.

[Drawing 9] It is the perspective view showing the directions member used for the 2nd coordinate input unit.

[Drawing 10] It is the front view showing an example which pointed by the directions member to one in the information input area of the 2nd coordinate input unit.

[Drawing 11] It is the explanatory view showing detection actuation of CCD typically.

[Drawing 12] It is the top view showing roughly the optical unit used for the 3rd coordinate input unit.

[Drawing 13] It is the front view showing an example which pointed by the directions member to one in the information input area of the 3rd coordinate input unit.

[Drawing 14] It is the graph which shows the relation between optical reinforcement and time amount.

[Drawing 15] It is the front view showing an example which pointed by the directions member to one in the information input area of the 4th coordinate input unit.

[Drawing 16] It is the graph which shows the relation between optical reinforcement and time amount.

[Drawing 17] It is the front view showing the configuration of the 5th coordinate input unit roughly.

[Drawing 18] It is an outline front view for explaining the detection actuation.

[Drawing 19] It is an explanatory view explaining the icon actuation using information input/output system.

[Drawing 20] It is a flow chart explaining the processing which information input/output system performs.

[Drawing 21] It is a front view explaining the menu manipulation performed with information input/output system.

[Drawing 22] It is this front view.

[Drawing 23] It is an explanatory view about calculation of two or more position coordinates.

[Drawing 24] It is the flow chart which shows roughly the flow of processing including real-image judging processing.

[Drawing 25] It is an explanatory view about calculation of two or more position coordinates.

[Drawing 26] It is the flow chart which shows the flow of real-image judging processing roughly.

[Drawing 27] It is a vector diagram for explaining the coordinate vector value calculation approach.

[Drawing 28] It is the explanatory view showing a vector table typically.

[Drawing 29] It is the explanatory view showing the motion in the case of drawing a straight line.

[Drawing 30] It is the explanatory view showing the motion in the case of changing the direction of a straight line a lot, and drawing it.

[Drawing 31] It is the explanatory view showing the condition that a real image can be decided automatically.

[Drawing 32] As the directions member of 1 has described, it is the explanatory view showing the condition that other directions members were inserted into the information input area.

[Drawing 33] It is an explanatory view explaining the dial actuation using information input/output system.

[Drawing 34] It is the flow chart of processing of dial actuation.

[Drawing 35] It is an explanatory view explaining the coordinate detection in the case of dial actuation.

[Drawing 36] It is an explanatory view explaining the coordinate detection in the case of dial actuation.

[Drawing 37] It is an explanatory view about the operation performed in the case of dial actuation.

[Drawing 38] It is an explanatory view explaining actuation of the door and pallet using information input/output system.

[Drawing 39] It is a flow chart explaining processing of actuation of a door and a pallet.

[Drawing 40] It is an explanatory view explaining the coordinate detection in the case of actuation of a door and a pallet.

[Drawing 41] It is an explanatory view explaining the operation performed in the case of actuation of a door and a pallet.

[Drawing 42] It is an explanatory view explaining actuation of the pallet using information input/output system.

[Drawing 43] It is a flow chart explaining processing of actuation of a pallet.

[Drawing 44] It is an explanatory view explaining the coordinate detection in the case of actuation of a pallet.

[Drawing 45] It is an explanatory view explaining the coordinate detection in the case of actuation of a pallet.

[Drawing 46] It is an explanatory view explaining the coordinate detection in the case of actuation of a pallet.

[Drawing 47] It is an explanatory view explaining actuation of the slider bar using information input/output system.

[Drawing 48] It is a flow chart explaining processing of actuation of a slider bar.

[Drawing 49] It is an explanatory view explaining the coordinate detection in the case of actuation of a slider bar.

[Drawing 50] It is an explanatory view explaining the coordinate detection in the case of actuation of a slider bar.

[Drawing 51] It is a flow chart explaining selection of an actuation image.

[Drawing 52] It is an explanatory view explaining expansion of the object using information input/output system, and contraction actuation.

[Drawing 53] It is a flow chart explaining expansion of an object, and contraction actuation.

[Drawing 54] It is an explanatory view explaining the display of a pallet.

[Drawing 55] It is an explanatory view explaining the display of a slider bar.

[Description of Notations]

1 Information Input/output System

2 Display

2a Screen

3 Coordinate Input Unit

4 I/O Device



17 Storage  
26 Storage  
94 Actuation Image, Icon  
101 Actuation Image, Dial  
102 Door  
103 Actuation Image, Pallet  
104 Actuation Image, Pallet  
105 Actuation Image, Slider Bar  
106 Actuation Image

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[Translation done.]

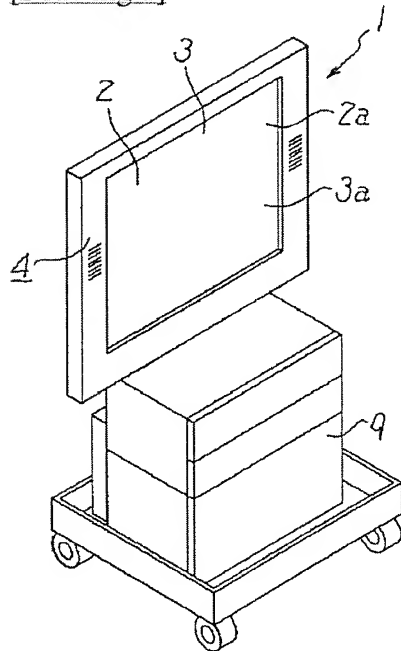
## \* NOTICES \*

JPO and INPIT are not responsible for any damages caused by the use of this translation.

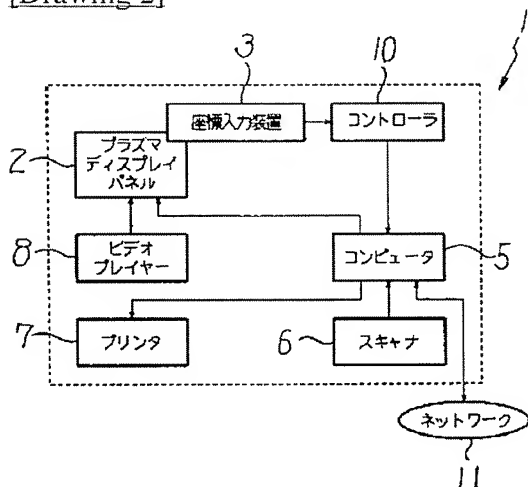
- 1.This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

## DRAWINGS

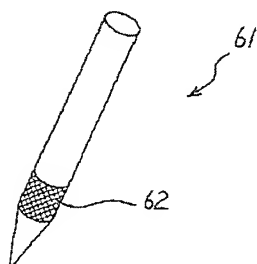
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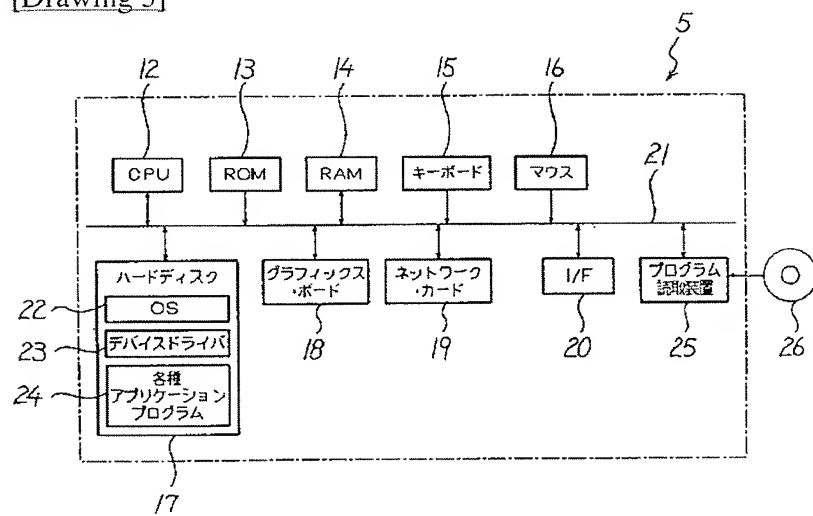
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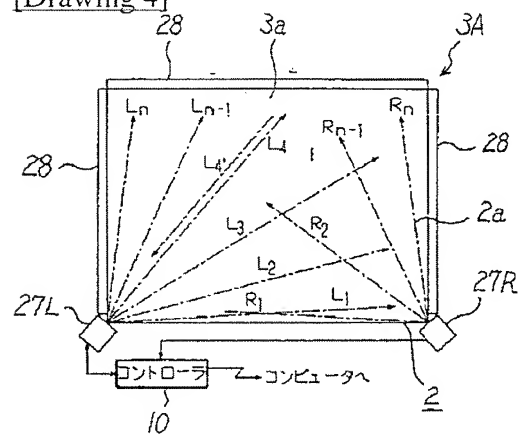
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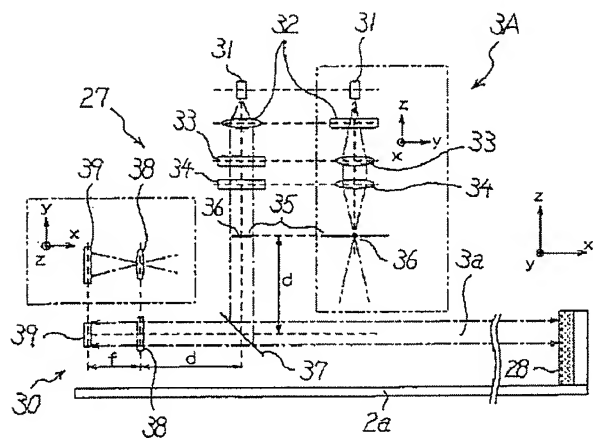
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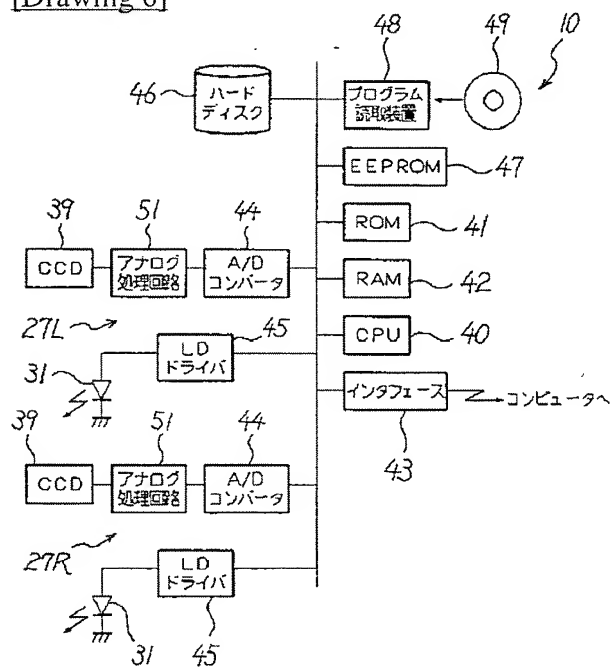
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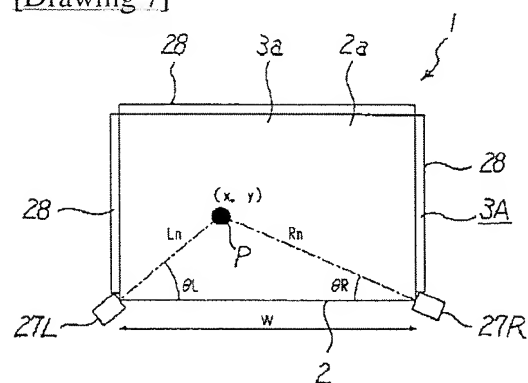
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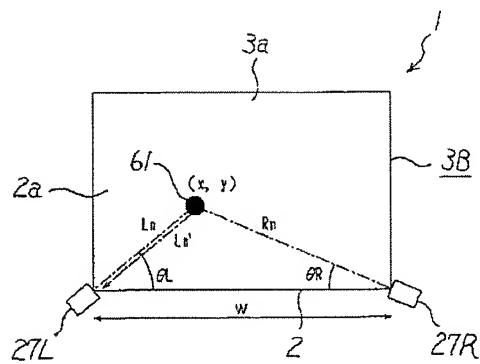
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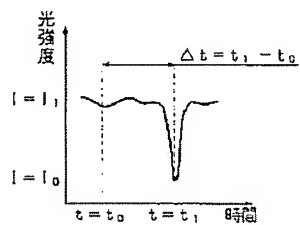
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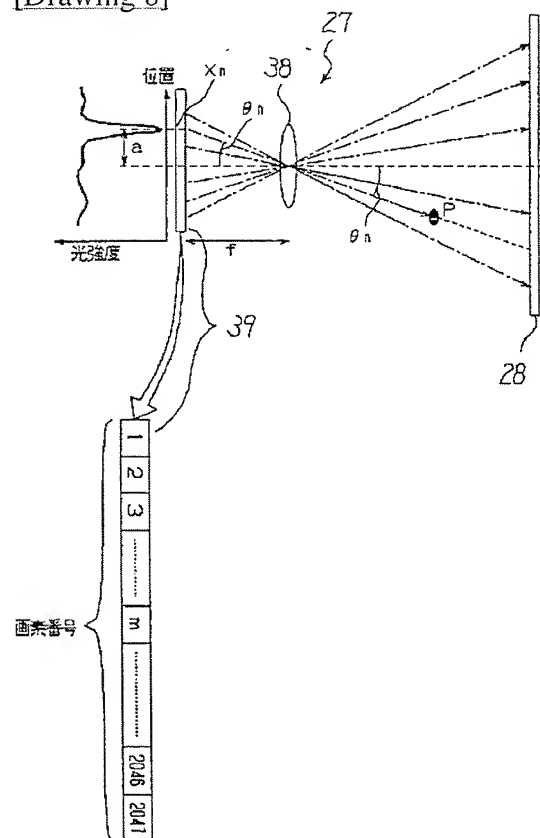
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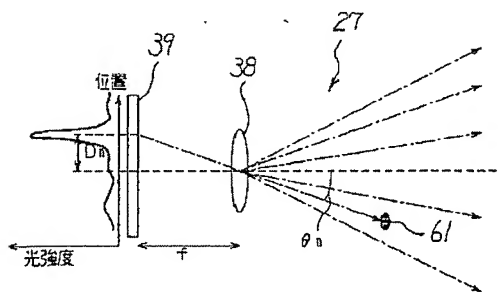
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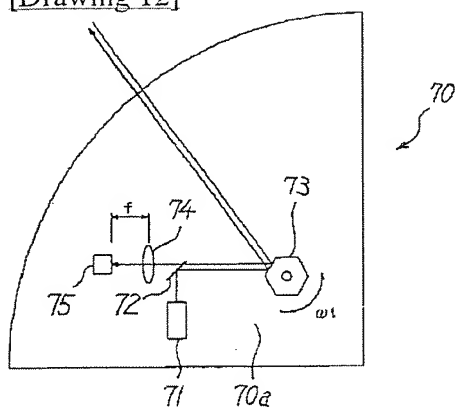
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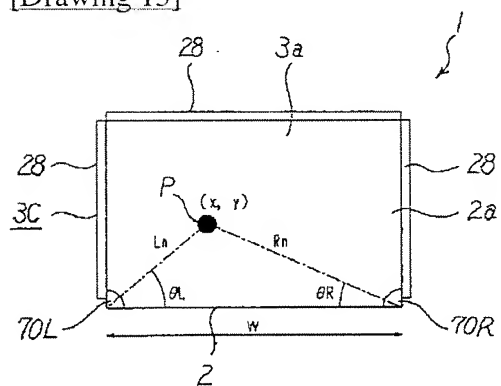
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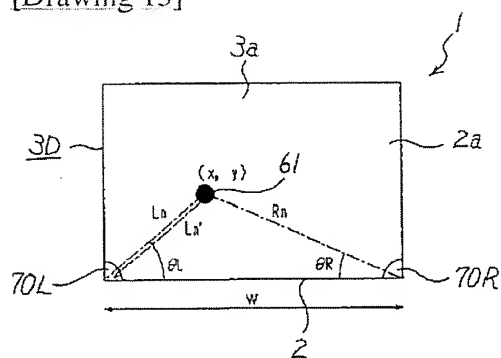
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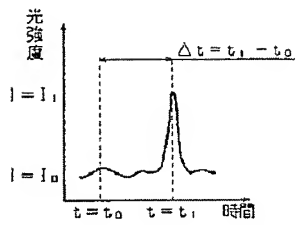


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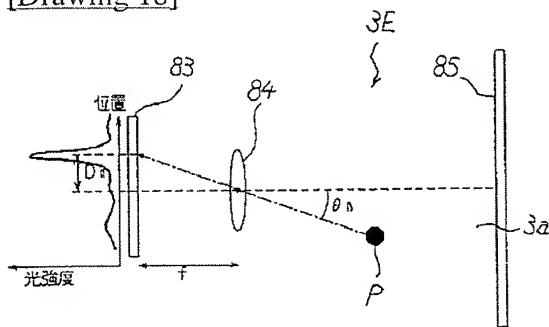


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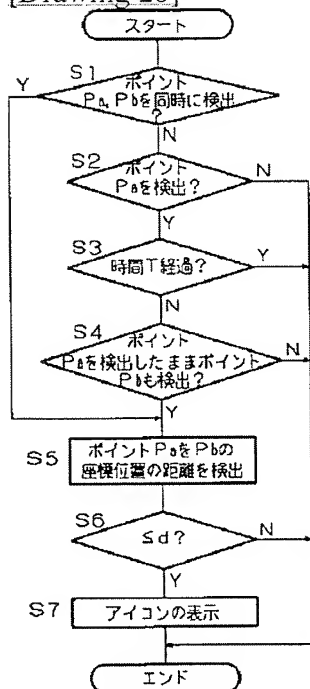




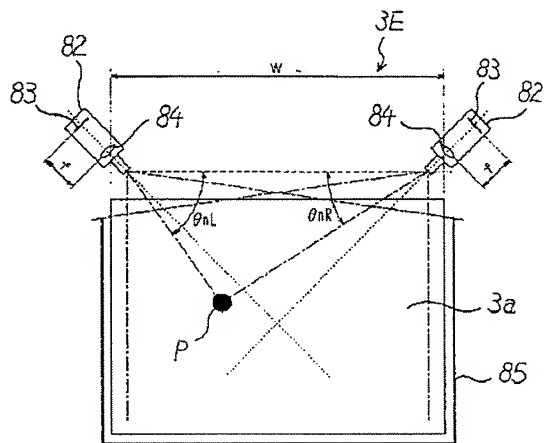
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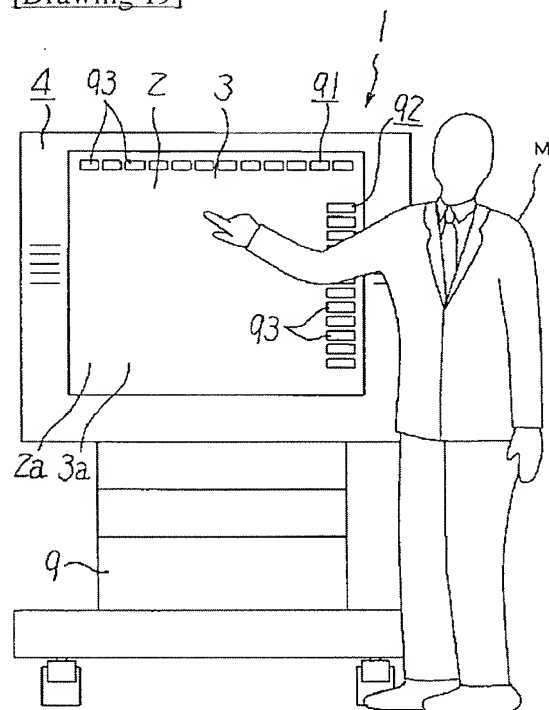
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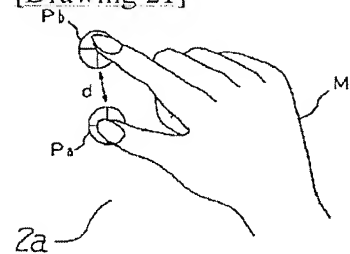
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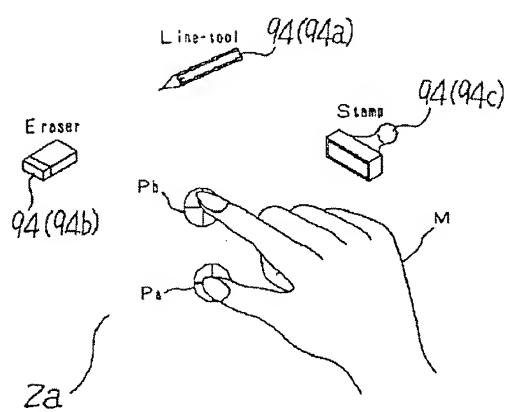
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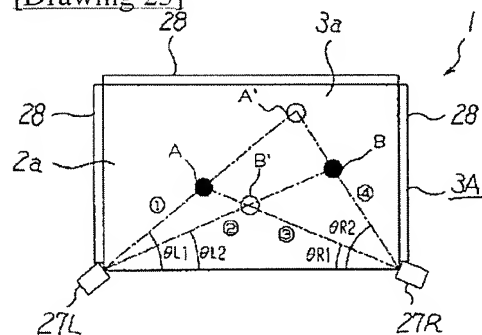
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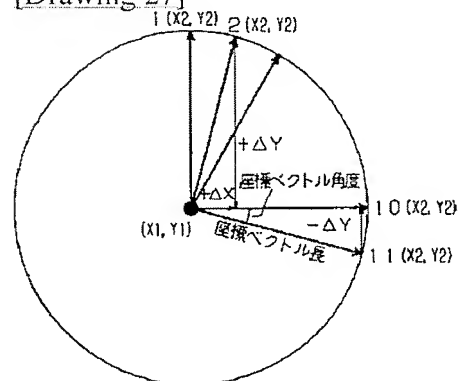
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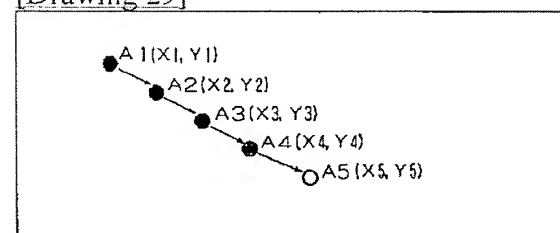
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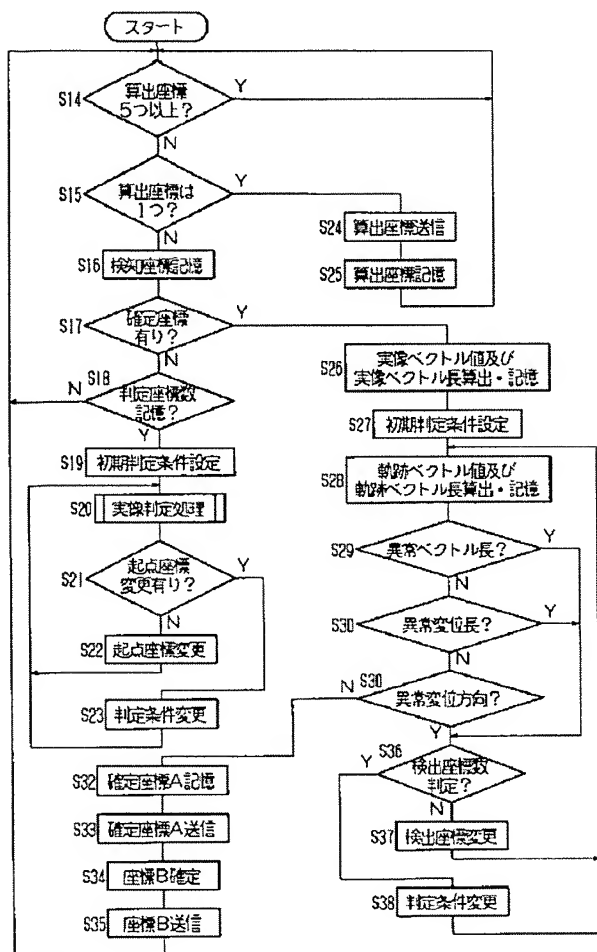
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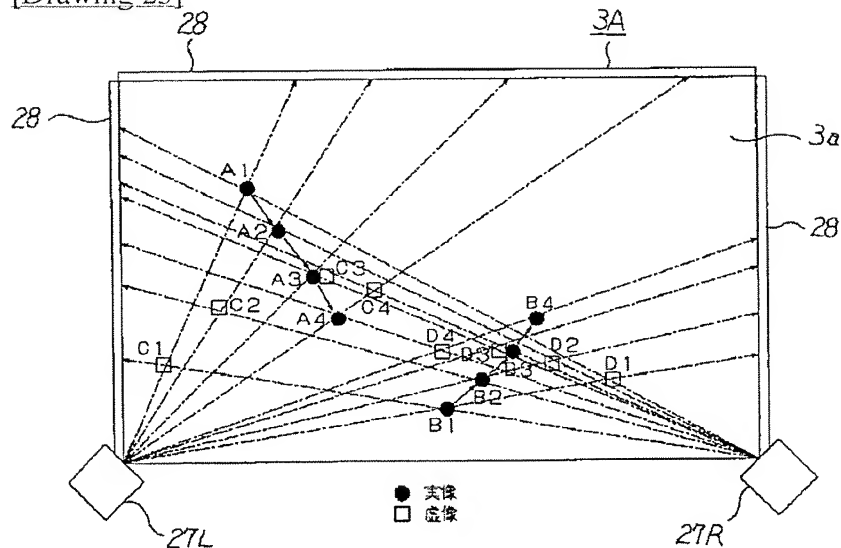
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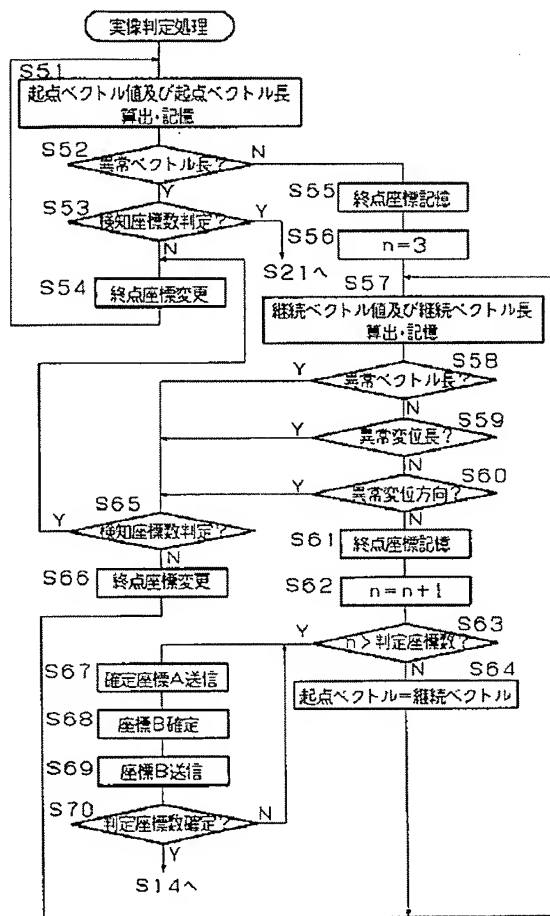
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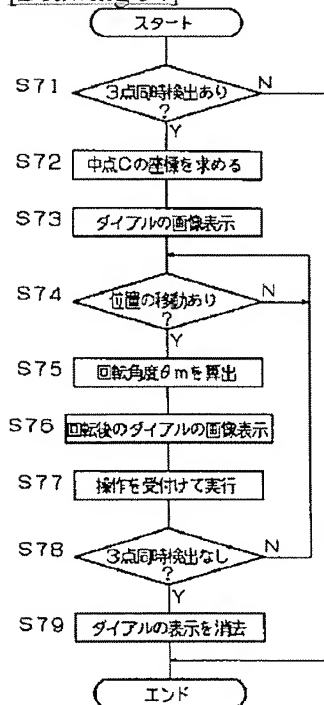
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[Drawing 26]



[Drawing 34]

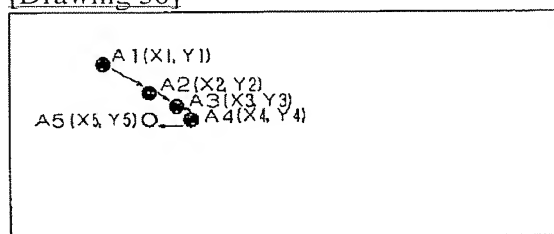


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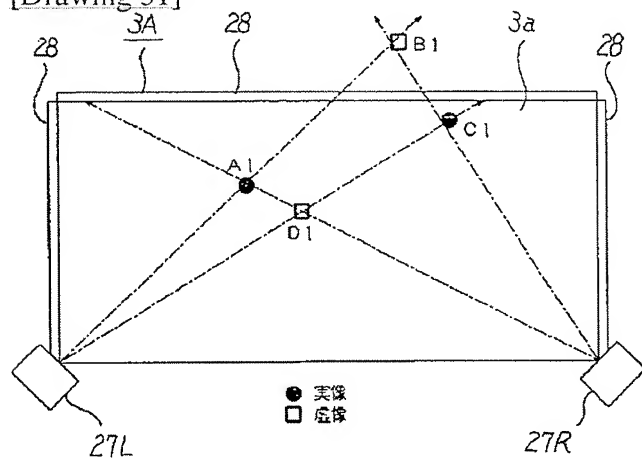
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座標ベクトル値	$\Delta X$	$\Delta Y$	$\Delta Y/\Delta X$	座標ベクトル角度
1	0	+	$\infty$ (tan90°)	90°
2	+	+	5.671 (tan80°)	80°
3	+	+	2.747 (tan70°)	70°
4	+	+	1.732 (tan60°)	60°
5	+	+	1.192 (tan50°)	50°
6	+	+	0.839 (tan40°)	40°
7	+	+	0.577 (tan30°)	30°
8	+	+	0.364 (tan20°)	20°
9	+	+	0.176 (tan10°)	10°
10	+	0	0 (tan0°)	0°
11	+	-	0.176 (tan10°)	10°
12	+	-	0.364 (tan20°)	20°
13	+	-	0.577 (tan30°)	30°
14	+	-	0.839 (tan40°)	40°
15	+	-	1.192 (tan50°)	50°
16	+	-	1.732 (tan60°)	60°
17	+	-	2.747 (tan70°)	70°
18	+	-	5.671 (tan80°)	80°
19	0	-	$\infty$ (tan90°)	90°
20	-	-	5.671 (tan80°)	80°
21	-	-	2.747 (tan70°)	70°
22	-	-	1.732 (tan60°)	60°
23	-	-	1.192 (tan50°)	50°
24	-	-	0.839 (tan40°)	40°
25	-	-	0.577 (tan30°)	30°
26	-	-	0.364 (tan20°)	20°
27	-	-	0.176 (tan10°)	10°
28	-	0	0 (tan0°)	0°
29	-	+	0.176 (tan10°)	10°
30	-	+	0.364 (tan20°)	20°
31	-	+	0.577 (tan30°)	30°
32	-	+	0.839 (tan40°)	40°
33	-	+	1.192 (tan50°)	50°
34	-	+	1.732 (tan60°)	60°
35	-	+	2.747 (tan70°)	70°
36	-	+	5.671 (tan80°)	80°

[Drawing 30]

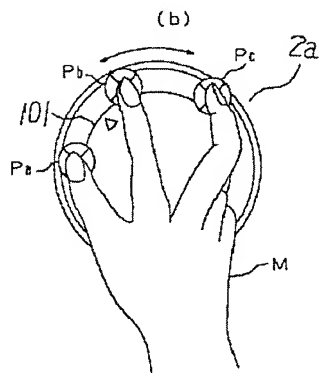
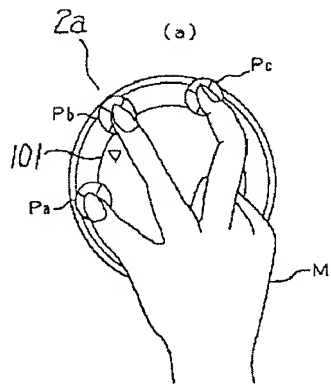


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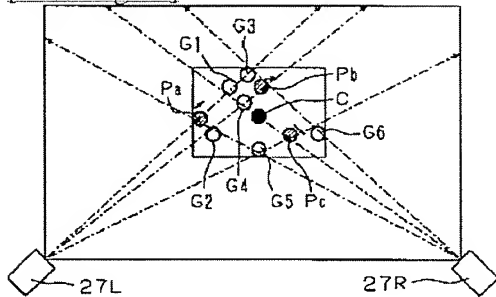


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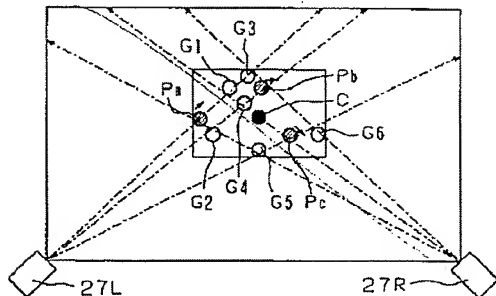




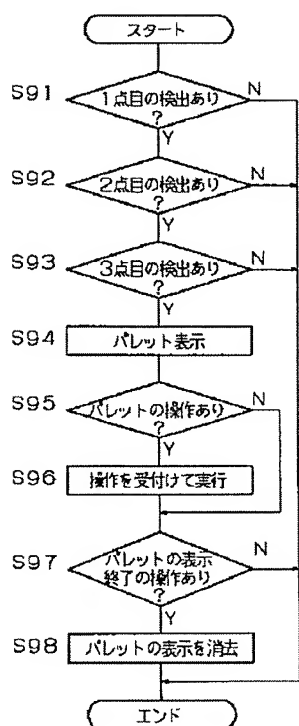
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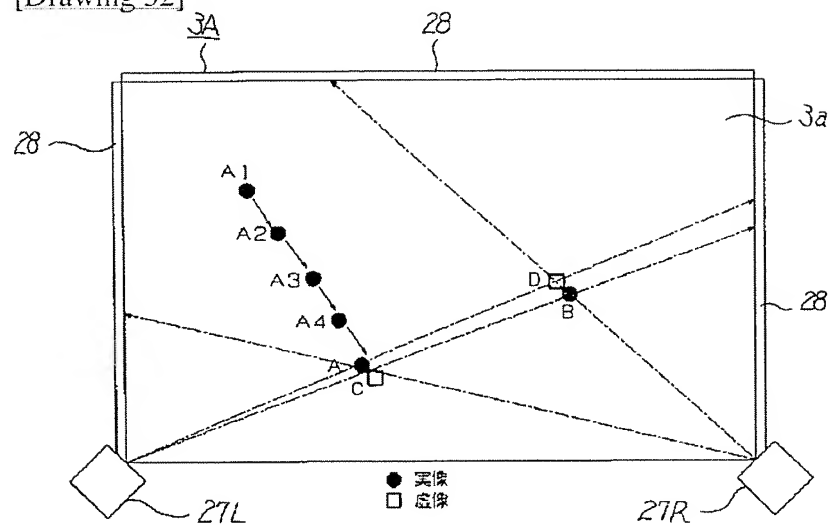
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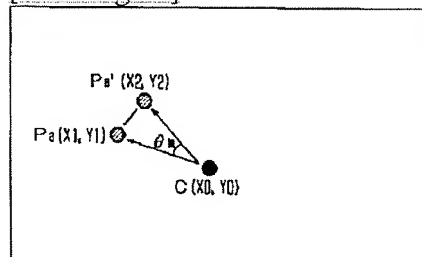
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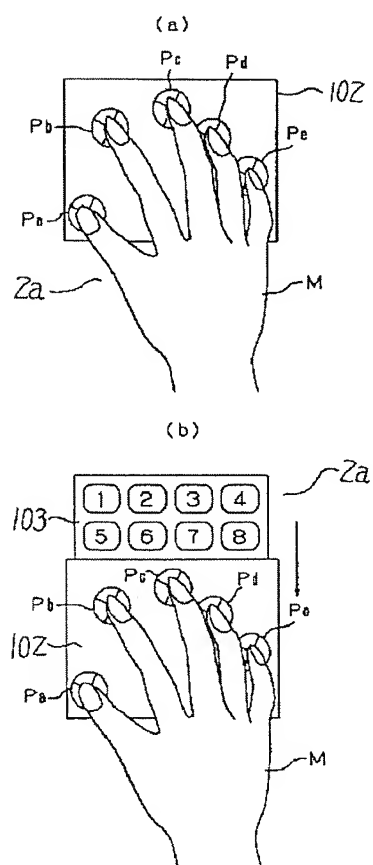
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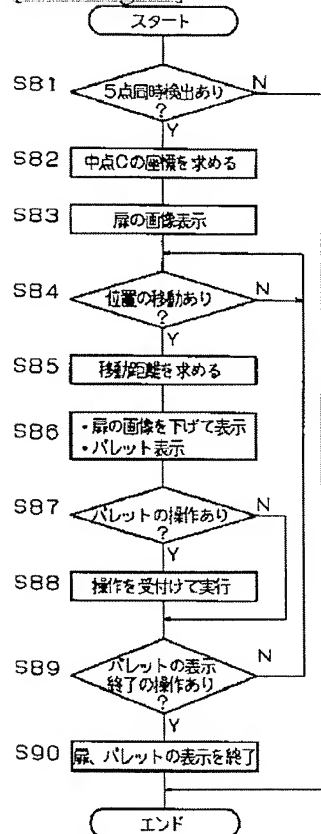
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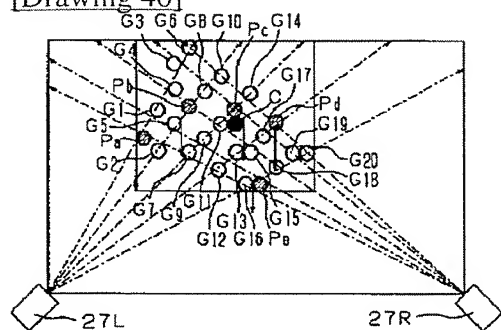
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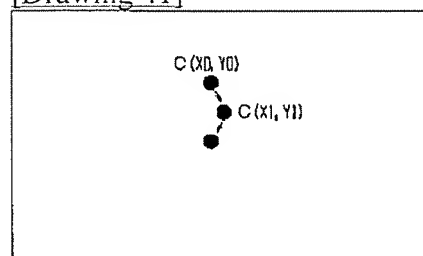
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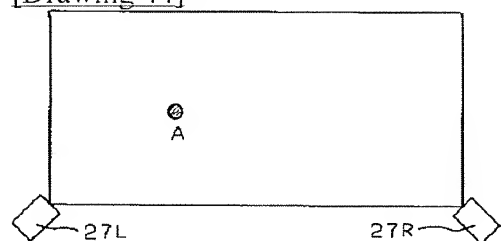
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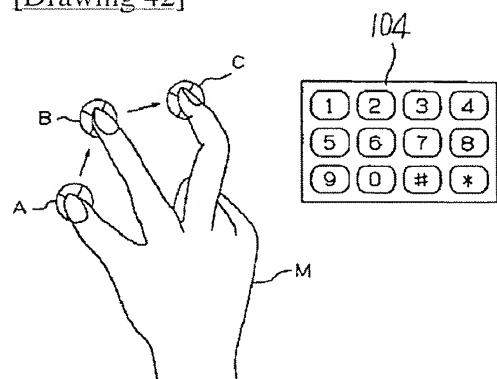
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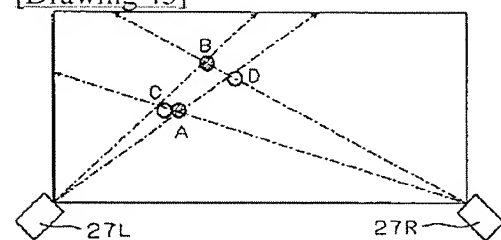
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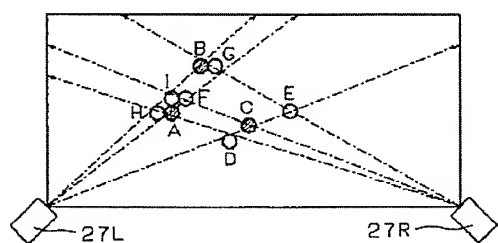
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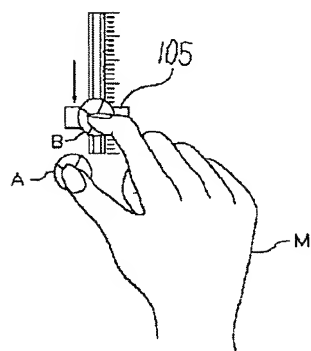
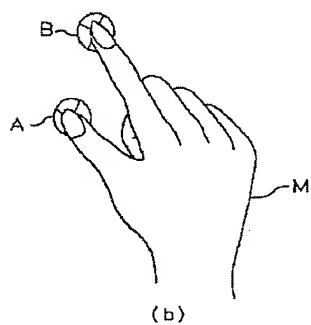
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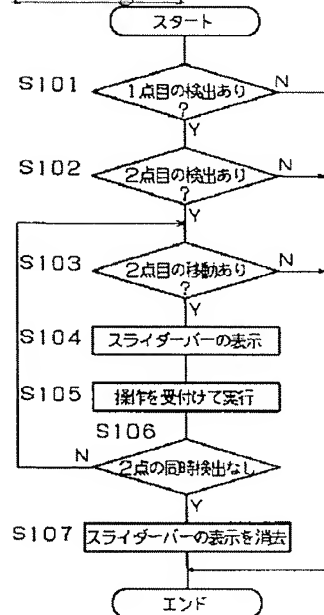
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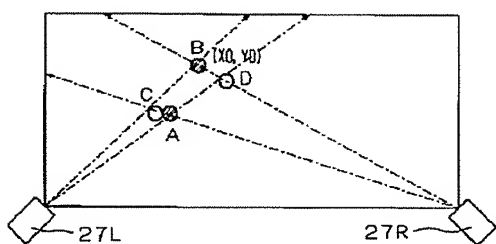
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(a)



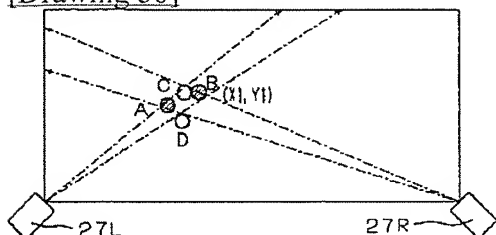
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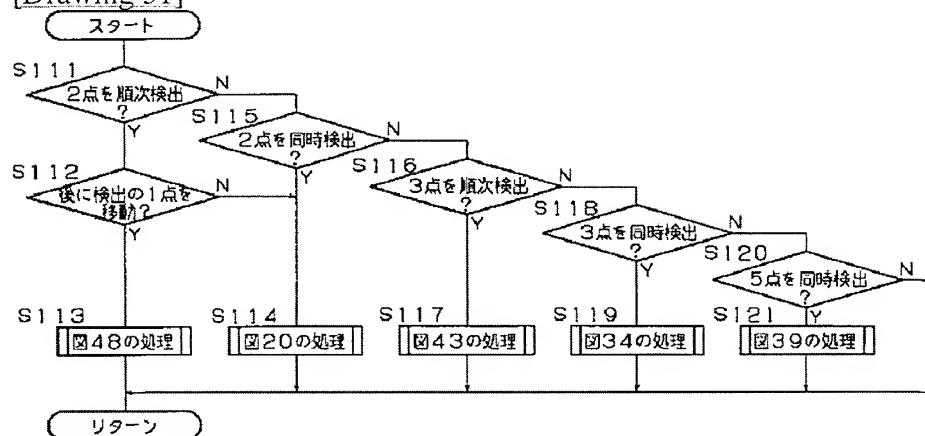
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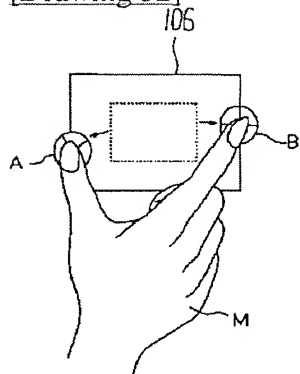
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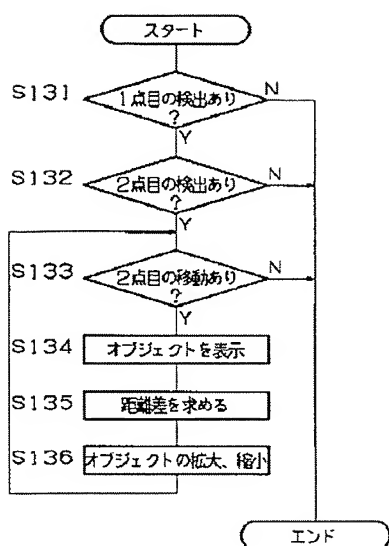


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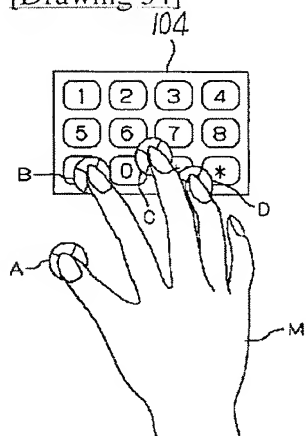


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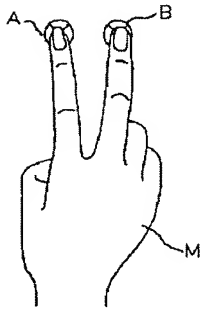


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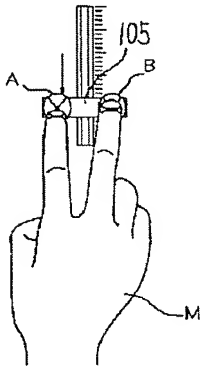


[Drawing 55]

(a)



(b)



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[Translation done.]

(19) 日本国特許庁 (J P)

## (12) 公開特許公報 (A)

(11) 特許出願公開番号

特開2003-173237

(P2003-173237A)

(43) 公開日 平成15年6月20日 (2003.6.20)

(51) Int.Cl. <sup>7</sup>	識別記号	F I	キーワード (参考)
G 0 6 F 3/033	3 6 0	G 0 6 F 3/033	3 6 0 C 5 B 0 8 7
3/00	6 5 4	3/00	6 5 4 A 5 C 0 8 2
	6 5 7		6 5 7 A 5 E 5 0 1
G 0 9 G 5/00	5 1 0	G 0 9 G 5/00	5 1 0 H
	5 5 0		5 5 0 B

審査請求 未請求 請求項の数23 O L (全 31 頁) 最終頁に続く

(21) 出願番号	特願2002-59431 (P2002-59431)	(71) 出願人	000006747 株式会社リコー 東京都大田区中馬込1丁目3番6号
(22) 出願日	平成14年3月5日 (2002.3.5)	(72) 発明者	諸星 博 東京都大田区中馬込1丁目3番6号 株式 会社リコー内
(31) 優先権主張番号	特願2001-300559 (P2001-300559)	(74) 代理人	100101177 弁理士 柏木 慎安 (外2名)
(32) 優先日	平成13年9月28日 (2001.9.28)		
(33) 優先権主張国	日本 (J P)		

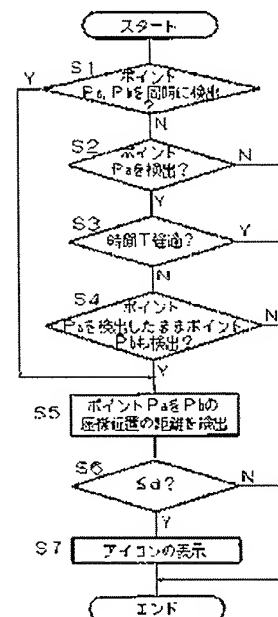
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(54) 【発明の名称】 情報入出力システム、プログラム及び記憶媒体

## (57) 【要約】

【課題】 すぐ手元の画面上でアイコンを操作することを可能として、操作性を向上させる。

【解決手段】 プラズマディスプレイである表示装置の画面には、その画面上を手指などで指し示した位置の座標を検出する座標入力装置が設けられている。そして、手指などで画面の2点を同時に指し示したことを座標入力装置で検出した場合のみ (ステップ S1 の Y、S2 の Y、S4 の Y)、予め所定のテーブルに登録されているアイコンを指し示した位置の近傍に表示する (ステップ S7)。



(2)

特開2003-173237

1

2

【特許請求の範囲】

【請求項1】 画像を表示する表示装置と、この表示装置の画面上で指し示された複数の位置の当該画面上における座標を検出する座標入力装置とを備え、前記座標入力装置で検出した座標に基づいて前記表示装置の表示を行なう情報入出力システムにおいて、

予め操作画像を登録しておく記憶装置と、前記座標入力装置により前記画面上で複数の位置が指し示されていることを検出したときは、前記画面上における所定位置に前記記憶装置に登録されている操作画像を表示する操作画像表示手段と、を備えていることを特徴とする情報入出力システム。

【請求項2】 前記複数位置をそれぞれ指し示した時点間の時間を計時する計時手段と、この計時した時間が予め設定されている所定時間以下であるか否かを判断する第1の比較手段とを備え、前記操作画像表示手段は、前記計時時間が前記所定時間以下であることを条件に前記操作画像の表示を行なう、ことを特徴とする請求項1に記載の情報入出力システム。

【請求項3】 前記複数位置をそれぞれ指し示した座標間の距離を演算する測距手段と、この演算した距離が予め設定されている所定距離以下であるか否かを判断する第2の比較手段とを備え、前記操作画像表示手段は、前記演算距離が前記所定距離以下であることを条件に前記操作画像の表示を行なう、ことを特徴とする請求項1又は2に記載の情報入出力システム。

【請求項4】 前記記憶装置は、その登録される操作画像の種類、その数及び前記複数座標の少なくとも1つを基準とした前記表示装置での表示位置のうち少なくとも前記種類について登録されていて、前記操作画像表示手段は、前記記憶装置の登録内容にしたがって前記操作画像の表示を行なう、ことを特徴とする請求項1～3のいずれかの一に記載の情報入出力システム。

【請求項5】 前記記憶装置への登録内容の入力を受け付ける受付手段と、この入力を受け付けがされたときは当該受け付けた内容で前記記憶装置の登録内容を更新する更新手段と、を備えていることを特徴とする請求項4に記載の情報入出力システム。

【請求項6】 前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出手段と、前記操作画像が表示された状態で前記移動検出手段による前記検出があったときは、当該検出距離及び方向に応じて所定の操作を受け付けて実行する操作手段と、を備えていることを特徴とする請求項1に記載の情報入出力システム。

【請求項7】 前記操作画像表示手段は、前記操作画像

が表示された状態で前記移動検出手段による検出があったときは、当該検出距離及び方向に応じて前記操作画像の前記画面上での表示位置を変更するものである、ことを特徴とする請求項6に記載の情報入出力システム。

【請求項8】 前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出手段と、前記移動検出手段による前記検出があったときは当該検出距離及び方向に応じて前記操作画像の前記画面上での大きさを拡大又は縮小する拡大縮小手段と、を備えていることを特徴とする請求項1に記載の情報入出力システム。

【請求項9】 前記座標入力装置により前記画面上で複数の位置が指し示されていることを検出したときは、前記画面上における所定位置に屏を表示する屏表示手段と、

前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出手段と、

前記屏が表示された状態で前記移動の検出があったときは、当該検出距離及び方向に応じて前記屏の前記画面上での表示位置を変更する屏変更手段と、を備え、

前記操作画像表示手段は、前記操作画像を前記表示位置の変更された前記屏の下から当該屏の移動にしたがって徐々に出現するように表示するものである、請求項1に記載の情報入出力システム。

【請求項10】 前記操作画像は、アイコン、ダイヤル、スライダーバー又はバレットである、ことを特徴とする請求項1～9のいずれかの一に記載の情報入出力システム。

【請求項11】 前記記憶装置は、前記操作画像を複数種類登録していて、前記操作画像表示手段は、前記指し示された位置の数及び当該指し示しが同時に行なわれたか又は順次行なわれたかに応じて、前記操作画像の表示を前記複数種類の操作画像の中から選択して行なうこと、を特徴とする請求項1～10のいずれかの一に記載の情報入出力システム。

【請求項12】 画像を表示する表示装置と、この表示装置の画面上で指し示された複数の位置の当該画面上における座標を検出する座標入力装置とを備え、前記座標入力装置で検出した座標に基づいて前記表示装置の表示を行なう情報入出力システムの制御を行なうことを、コンピュータに実行させるコンピュータに読み取り可能なプログラムにおいて、

前記座標入力装置により前記画面上で複数の位置が指し示されていることを検出したときは、前記画面上における所定位置に予め記憶装置に登録されている操作画像を表示する操作画像表示手段を、コンピュータに実行させることを特徴とするプログラム。

【請求項13】 前記複数位置をそれぞれ指し示した時

50

(3)

特開2003-173237

3

4

点間の時間を計時する計時処理と、

この計時した時間が予め設定されている所定時間以下であるか否かを判断する第1の比較処理と、をコンピュータに実行させ、

前記操作画像表示処理は、前記計時時間が前記所定時間以下であることを条件に前記操作画像の表示を行なう、ことを特徴とする請求項12に記載のプログラム。

【請求項14】 前記複数位置をそれぞれ指し示した座標間の距離を演算する測距処理と、この演算した距離が予め設定されている所定距離以下であるか否かを判断する第2の比較処理と、をコンピュータに実行させ、

前記操作画像表示処理は、前記演算距離が前記所定距離以下であることを条件に前記操作画像の表示を行なう、ことを特徴とする請求項12又は13に記載のプログラム。

【請求項15】 前記操作画像表示処理は、その登録される操作画像の種類、その数及び前記複数座標の少なくとも1つを基準とした前記表示装置での表示位置のうち少なくとも前記種類について登録されている前記記憶装置の登録内容にしたがって前記操作画像の表示を行なう、ことを特徴とする請求項12～14のいずれかの一に記載のプログラム。

【請求項16】 前記記憶装置への登録内容の入力を受け付ける受付処理と、この入力を受け付けがされたときは当該受け付けた内容で前記記憶装置の登録内容を更新する更新処理と、をコンピュータに実行させることを特徴とする請求項15に記載のプログラム。

【請求項17】 前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出処理と、前記操作画像が表示された状態で前記移動検出手段による前記検出があったときは、当該検出距離及び方向に応じて所定の操作を受け付けて実行する操作処理と、をコンピュータに実行させることを特徴とする請求項12に記載のプログラム。

【請求項18】 前記操作画像表示処理は、前記操作画像が表示された状態で前記移動検出手段による検出があったときは、当該検出距離及び方向に応じて前記操作画像の前記画面上での表示位置を変更するものである、ことを特徴とする請求項17に記載のプログラム。

【請求項19】 前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出処理と、前記移動検出処理による前記検出があったときは当該検出距離及び方向に応じて前記操作画像の前記画面上での大きさを拡大又は縮小する拡大縮小処理と、をコンピュータに実行させることを特徴とする請求項12に記載のプログラム。

【請求項20】 前記座標入力装置により前記画面上で複数の位置が指し示されていることを検出したときは、

前記画面上における所定位置に屏を表示する屏表示処理と、

前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出処理と、

前記屏が表示された状態で前記移動の検出があったときは、当該検出距離及び方向に応じて前記屏の前記画面上での表示位置を変更する屏変更処理と、をコンピュータに実行させ、

前記操作画像表示処理は、前記操作画像を前記表示位置の変更された前記屏の下から当該屏の移動にしたがって徐々に出現するように表示するものである、請求項12に記載のプログラム。

【請求項21】 前記操作画像表示処理は、前記操作画像としてアイコン、ダイアル、スライダー又はパレットを表示する、ことを特徴とする請求項12～20のいずれかの一に記載のプログラム。

【請求項22】 前記操作画像表示処理は、前記指し示された位置の数及び当該指し示しが同時に行なわれたか又は順次行なわれたかに応じて、前記操作画像の表示を前記記憶装置に複数種類登録されている操作画像の中から選択して行なうこと、を特徴とする請求項12～21のいずれかの一に記載のプログラム。

【請求項23】 請求項12～22のいずれかの一に記載のプログラムを記憶していることを特徴とする記憶媒体。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】この発明は、情報入出力システム及びプログラムに関する。

【0002】

【従来の技術】近年、文字および画像を表示するための表示装置と、表示装置の前面に情報入力面（タッチパネル面）を配設した座標入力装置と、座標入力装置からの入力に基づいて表示装置の表示制御を行なう制御装置とを備え、表示装置および座標入力装置を用いて電子黒板の表示面および書き込み面を構成した情報入出力システムが提供されている。

【0003】例えば、スマート・テクノロジーズ社製（SMART Technologies Inc.）のスマート2000は、コンピュータに接続された液晶プロジェクターを用いて文字・絵・図形・グラフィックの画像をパネルに投影した状態で、パネルの投影面（表示面）の前面に配設された座標入力装置（書き込み面）を用いて手書きの情報をコンピュータに取り込む処理を行なう。そして、コンピュータ内で手書きの情報と画像情報とを合成し、再度、液晶プロジェクターを介してリアルタイムで表示できるようにしている。

【0004】このような情報入出力システムでは、表示装置によって表示されている画面上の画像に対して、座標入力装置を用いて入力した画像を上書き画像として重

(4)

特開2003-173237

5

5

ねて表示できるため、会議、プレゼンテーション、教育現場等において既に広く利用されており、その使用効果が高く評価されている。また、このような情報入出力システムに音声・画像等の通信機能を組み込み、遠隔地間を通信回線で接続することにより、電子会議システムとしても利用されている。

【0005】また、これらの情報入出力システムに用いる座標入力装置として種々の方式の技術が提案されている。すなわち、この座標入力装置としては、タッチパネル面のような物理的な面を有する方式のほか、光学式の

【0006】

【発明が解決しようとする課題】ところで、前記のような情報入出力システムを用い、その画面上で各種アプリケーションなどを操作する場合には、画面上にツールバーを表示し、このツールバー上のアイコンを手指、ペンなどの指示部材で指し示すことにより行なうか、あるいは、専用のリモコンを操作することにより行なうことが考えられる。指示部材でアイコンを指し示す場合は、当該指示部材の指し示す位置の座標を座標入力装置で検出し、どのアイコンを指し示しているのかを判断する。

【0007】しかしながら、情報入出力システムで用いるディスプレイは40インチ、50インチといった大画面のものを想定しており、画面上のツールバー（通常、画面の上下又は左右の端に表示されるであろう）のアイコンを指示部材で指し示そうとすると、ユーザは、アイコンを操作するためにいちいち四肢を大きく伸ばしたり、所望のアイコンが表示されている位置まで歩み寄ったり、あるいは、椅子に座って操作する場合にはアイコンをクリックするたびにわざわざ立ち上がったことが必要となり、操作が極めて煩雑であるという不具合がある。

【0008】また、前記のように専用のリモコンで操作する場合には、情報入出力システムの画面上で操作することができないため、画面を見ながら、あるいは、説明しながら操作を行なうような場合には、やはり操作が極めて煩雑であるという不具合がある。

【0009】この発明の目的は、すぐ手元の画面上でアイコンを操作することを可能として、操作性を向上させることである。

【0010】この発明の別の目的は、この操作性を向上させる場合に、画面上の1箇所を指し示すことで行なう操作とは容易に区別できるようにすることである。

【0011】この発明の別の目的は、前記の操作性を向上させる場合に、アイコンの表示を目的とせずに画面上の複数箇所を指し示す場合を容易に区別できるようにすることである。

【0012】この発明の別の目的は、前記の場合に、予め登録されている種類、数又は表示位置でアイコンを表

示できるようにすることである。

【0013】この発明の別の目的は、前記の場合に、表示させるアイコンの詳細についてユーザが所望に登録できるようにして、更に操作性を向上させることである。

【0014】この発明の別の目的は、画面上の指し示し位置の移動により、ユーザは所定の操作を実行できるようにすることである。

【0015】この発明の別の目的は、画面上の指し示し位置の移動に応じて、操作画像を操作したように表示できるようにすることである。

【0016】この発明の別の目的は、操作画像を所望のサイズに容易に拡大、縮小して、操作しやすくすることである。

【0017】この発明の別の目的は、画面上での指し示し方の違いにより、各種の操作画像を選択的に表示させることである。

【0018】

【課題を解決するための手段】請求項1に記載の発明は、画像を表示する表示装置と、この表示装置の画面上で指し示された複数の位置の当該画面上における座標を検出する座標入力装置とを備え、前記座標入力装置で検出した座標に基づいて前記表示装置の表示を行なう情報入出力システムにおいて、予め操作画像を登録しておく記憶装置と、前記座標入力装置により前記画面上で複数の位置が指し示されていることを検出したときは、前記画面上における所定位置に登録されている操作画像を表示する操作画像表示手段と、を備えていることを特徴とする情報入出力システムである。

【0019】この明細書において、操作画像とは、画面上に表示される図形であって、その図形に対して手指などで所定の動作を行なうことにより、ユーザが様々な操作を情報入出力システムに対して行なうことを受けけるものであり、例えば、アイコン、ダイアル、スライダーバー、バレットなどである。

【0020】したがって、片手の手指などで画面上の複数箇所を指し示すだけの簡単な操作により、その指し示した位置の近傍等に必要な操作画像を表示することができるので、すぐ手元の画面上で操作画像を操作することができ、操作性を向上させることができる。しかも、画面上の1箇所を指し示す場合には操作画像の表示はないので、1箇所を指し示すことで行なう操作とは容易に区別することができる。

【0021】請求項2に記載の発明は、請求項1に記載の発明において、前記複数位置をそれぞれ指し示した時点間の時間を計時する計時手段と、この計時した時間が予め設定されている所定時間以下であるか否かを判断する第1の比較手段とを備え、前記操作画像表示手段は、前記計時時間が前記所定時間以下であることを条件に前記操作画像の表示を行なう、ことを特徴とする。

【0022】したがって、ある程度の時間間隔をあけて



(5)

特開2003-173237

7

8

画面上の複数箇所を順次指し示したときは操作画像を表示しないので、操作画像の表示を目的とせずに画面上の複数箇所を指し示す場合を容易に区別することができる。

【0023】請求項3に記載の発明は、請求項1又は2に記載の発明において、前記複数位置をそれぞれ指し示した座標間の距離を演算する測距手段と、この演算した距離が予め設定されている所定距離以下であるか否かを判断する第2の比較手段とを備え、前記操作画像表示手段は、前記演算距離が前記所定距離以下であることを条件に前記操作画像の表示を行なう、ことを特徴とする。

【0024】したがって、ある程度の距離間隔をあけて画面上の複数箇所を指し示したときは操作画像を表示しないので、操作画像の表示を目的とせずに画面上の複数箇所を指し示す場合を容易に区別することができる。

【0025】請求項4に記載の発明は、請求項1～3のいずれかの一に記載の発明において、前記記憶装置は、その登録される操作画像の種類、その数及び前記複数座標の少なくとも1つを基準とした前記表示装置での表示位置のうち少なくとも前記種類について登録されている、前記操作画像表示手段は、前記記憶装置の登録内容にしたがって前記操作画像の表示を行なう、ことを特徴とする。

【0026】したがって、予め登録されている種類、数又は表示位置で操作画像を表示することができる。

【0027】請求項5に記載の発明は、請求項4に記載の発明において、前記記憶装置への登録内容の入力を受け付ける受付手段と、この入力の受け付けがされたときは当該受け付けた内容で前記記憶装置の登録内容を見直す更新手段と、を備えていることを特徴とする。

【0028】したがって、表示させる操作画像の詳細についてユーザの所望に登録することができるので、更に操作性を向上させることができる。

【0029】請求項6に記載の発明は、請求項1に記載の発明において、前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出手段と、前記操作画像が表示された状態で前記移動検出手段による前記検出があったときは、当該検出距離及び方向に応じて所定の操作を受け付けて実行する操作手段と、を備えていることを特徴とする。

【0030】したがって、画面上の指し示し位置の移動により、ユーザは所定の操作を実行することができる。

【0031】請求項7に記載の発明は、請求項6に記載の発明において、前記操作画像表示手段は、前記操作画像が表示された状態で前記移動検出手段による検出があったときは、当該検出距離及び方向に応じて前記操作画像の前記画面上での表示位置を変更する、ことを特徴とする。

【0032】したがって、画面上の指し示し位置の移動に応じて、操作画像を操作したように表示させることが

できる。

【0033】請求項8に記載の発明は、請求項1に記載の発明において、前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出手段と、前記移動検出手段による前記検出があったときは当該検出距離及び方向に応じて前記操作画像の前記画面上での大きさを拡大又は縮小する拡大縮小手段と、を備えていることを特徴とする。

【0034】したがって、操作画像を所望のサイズに容易に拡大、縮小して、操作しやすくすることができる。

【0035】請求項9に記載の発明は、請求項1に記載の発明において、前記座標入力装置により前記画面上で複数の位置が指し示されていることを検出したときは、前記画面上における所定位置に罫を表示する罫表示手段と、前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出手段と、前記罫が表示された状態で前記移動の検出があったときは、当該検出距離及び方向に応じて前記罫の前記画面上での表示位置を変更する罫変更手段と、を備え、前記操作画像表示手段は、前記操作画像を前記表示位置の変更された前記罫の下から当該罫の移動にしたがって徐々に出現するように表示するものである。

【0036】したがって、画面上で複数の位置を指し示したときに直ちに操作画像を表示せず、指し示した位置を移動すると徐々に移動する罫の下から操作画像を表示するようにすることができるので、あまり見せたくない操作画像を表示する場合などに好適である。

【0037】請求項10に記載の発明は、請求項1～9のいずれかの一に記載の発明において、前記操作画像は、アイコン、ダイヤル、スライダバー又はバレットである、ことを特徴とする。

【0038】したがって、操作画像としてアイコン、ダイヤル、スライダバー又はバレットを用いることができる。

【0039】請求項11に記載の発明は、請求項1～10のいずれかの一に記載の発明において、前記記憶装置は、前記操作画像を複数種類登録していて、前記操作画像表示手段は、前記指し示された位置の数及び当該指し示しと同時に実行されたか又は順次行われたかに応じて、前記操作画像の表示を前記複数種類の操作画像の中から選択して行なうこと、を特徴とする。

【0040】したがって、画面上での指し示し方の違いにより、各種の操作画像を選択的に表示させることができる。

【0041】請求項12に記載の発明は、画像を表示する表示装置と、この表示装置の画面上で指し示された複数の位置の当該画面上における座標を検出する座標入力装置とを備え、前記座標入力装置で検出した座標に基づいて前記表示装置の表示を行なう情報出力システムの制御を行なうことを、コンピュータに実行させるコンピ

9

ュータに読み取り可能なプログラムにおいて、前記座標入力装置により前記画面上で複数の位置が指し示されていることを検出したときは、前記画面上における所定位置に予め記憶装置に登録されている操作画像を表示する操作画像表示処理を、コンピュータに実行させることを特徴とするプログラムである。

【0042】したがって、片手の手指などで画面上の複数箇所を指し示すだけの簡単な操作により、その指し示した位置の近傍等に必要の操作画像を表示することができるので、すぐ手元の画面上で操作画像を操作することができ、操作性を向上させることができる。しかも、画面上の1箇所を指し示す場合には操作画像の表示はないので、1箇所を指し示すことで行なう操作とは容易に区別することができる。

【0043】請求項13に記載の発明は、請求項12に記載の発明において、前記複数位置をそれぞれ指し示した時点間の時間を計時する計時処理と、この計時した時間が予め設定されている所定時間以下であるか否かを判断する第1の比較処理と、をコンピュータに実行させ、前記操作画像表示処理は、前記計時時間が前記所定時間以下であることを条件に前記操作画像の表示を行なう、ことを特徴とする。

【0044】したがって、ある程度の時間間隔をあけて画面上の複数箇所を順次指し示したときは操作画像を表示しないので、操作画像の表示を目的とせずに画面上の複数箇所を指し示す場合を容易に区別することができる。

【0045】請求項14に記載の発明は、請求項12又は13に記載の発明において、前記複数位置をそれぞれ指し示した座標間の距離を演算する側処理と、この演算した距離が予め設定されている所定距離以下であるか否かを判断する第2の比較処理と、をコンピュータに実行させ、前記操作画像表示処理は、前記演算距離が前記所定距離以下であることを条件に前記操作画像の表示を行なう、ことを特徴とする。

【0046】したがって、ある程度の距離間隔をあけて画面上の複数箇所を指し示したときは操作画像を表示しないので、操作画像の表示を目的とせずに画面上の複数箇所を指し示す場合を容易に区別することができる。

【0047】請求項15に記載の発明は、請求項12～14のいずれかの一に記載の発明において、前記操作画像表示処理は、その登録される操作画像の種類、その数及び前記複数座標の少なくとも1つを基準とした前記表示装置での表示位置のうち少なくとも前記種類について登録されている前記記憶装置の登録内容にしたがって前記操作画像の表示を行なう、ことを特徴とする。

【0048】したがって、予め登録されている種類、数又は表示位置で操作画像を表示することができる。

【0049】請求項16に記載の発明は、請求項15に記載の発明において、前記記憶装置への登録内容の入力

(6)

特開2003-173237

10

を受付ける受付処理と、この入力を受け付けがされたときは当該受け付けた内容で前記記憶装置の登録内容を更新する更新処理と、をコンピュータに実行させることを特徴とする。

【0050】したがって、表示させる操作画像の詳細についてユーザの所望に登録することができるので、更に操作性を向上させることができる。

【0051】請求項17に記載の発明は、請求項12に記載の発明において、前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出処理をコンピュータに実行させ、操作画像表示処理は、この検出が前記操作画像が表示された状態であったときは当該検出距離及び方向に応じて前記操作画像の前記画面上での表示位置を変更するものである、ことを特徴とする。

【0052】したがって、画面上の指し示し位置の移動により、ユーザは所定の操作を実行することができる。

【0053】請求項18に記載の発明は、請求項17に記載の発明において、前記操作画像が表示された状態で前記移動検出手段による前記検出があったときは、当該検出距離及び方向に応じて所定の操作を受け付けて実行する操作処理を、コンピュータに実行させることを特徴とする。

【0054】したがって、画面上の指し示し位置の移動に応じて、操作画像を操作したように表示させることができる。

【0055】請求項19に記載の発明は、請求項12に記載の発明において、前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出処理と、前記移動検出処理による前記検出があったときは当該検出距離及び方向に応じて前記操作画像の前記画面上での大きさを拡大又は縮小する拡大縮小処理と、をコンピュータに実行させることを特徴とする。

【0056】したがって、操作画像を所望のサイズに容易に拡大、縮小して、操作しやすくすることができる。

【0057】請求項20に記載の発明は、請求項12に記載の発明において、前記座標入力装置により前記画面上で複数の位置が指し示されていることを検出したときは、前記画面上における所定位置に屏を表示する屏表示処理と、前記画面上の指し示し位置の移動の距離及び方向を検出する移動検出処理と、前記屏が表示された状態で前記移動の検出があったときは、当該検出距離及び方向に応じて前記屏の前記画面上での表示位置を変更する屏変更処理と、をコンピュータに実行させ、前記操作画像表示処理は、前記操作画像を前記表示位置の変更された前記屏の下から当該屏の移動にしたがって徐々に出現するように表示するものである。

【0058】したがって、画面上で複数の位置を指し示したときに直ちに操作画像を表示せず、指し示した位置を移動すると徐々に移動する屏の下から操作画像を表示するようにすることができるので、あまり見せたくない

11

操作画像を表示する場合などに好適である。

【0059】請求項21に記載の発明は、請求項12～20のいずれかの一に記載の発明において、前記操作画像表示処理は、前記操作画像としてアイコン、ダイヤル、スライダバー又はバレットを表示する、ことを特徴とする。

【0060】したがって、操作画像としてアイコン、ダイヤル、スライダバー又はバレットを用いることができる。

【0061】請求項22に記載の発明は、請求項12～21のいずれかの一に記載の発明において、前記操作画像表示処理は、前記指示された位置の数及び当該指示が同時に行なわれたか又は順次行なわれたかに応じて、前記操作画像の表示を前記記憶装置に複数種類登録されている操作画像の中から選択して行なうこと、を特徴とする。

【0062】したがって、画面上での指し示し方の違いにより、各種の操作画像を選択的に表示させることができる。

【0063】請求項23に記載の発明は、請求項12～22のいずれかの一に記載のプログラムを記憶していることを特徴とする記憶媒体である。

【0064】したがって、請求項12～22のいずれかの一に記載の発明と同様の作用、効果を奏することができる。

【0065】

【発明の実施の形態】この発明の一実施の形態について説明する。

【0066】図1は本実施の形態である情報出力システム1を概略的に示す外観斜視図であり、図2は情報出力システム1の電気的な接続を示すブロック図である。図1、図2に示すように、情報出力システム1は、表示装置であるプラズマディスプレイパネル（PDP）2及び座標入力装置3で構成される入出力装置であるパネル部4と、パーソナルコンピュータ等のコンピュータ5と、原稿の画像を読み取るためのスキャナ6と、画像データを記録紙に出力するプリンタ7と、ビデオプレイヤー8を収納する機器収納部9とを備えている。

【0067】PDP2は、電子黒板として利用可能な40インチや50インチ等の大画面タイプのもので、かかる大画面タイプのディスプレイであれば、CRT、LCDなどを用いてもよい。また、図示は省略するが、PDP2にはビデオ入力端子やスピーカーが設けられており、ビデオプレイヤー8をはじめ、その他レーザーディスクプレイヤー、DVDプレイヤー、ビデオカメラ等の各種情報機器やAV機器を接続し、PDP2を大画面モニタとして利用することが可能な構成になっている。

【0068】図2に示すように、情報出力システム1は、コンピュータ5にPDP2、スキャナ6、プリンタ7、ビデオプレイヤー8をそれぞれ接続し、コンピュ

(7)

特開2003-173237

12

タ5によってシステム全体を制御する構成である。また、コンピュータ5には、ペン等の指示部材や指先等の所定物体で指示された情報入力領域3a内の位置座標の演算等を行なう座標入力装置3用のコントローラ10が接続されており、このコントローラ10を介して座標入力装置3もコンピュータ5に接続されている。また、コンピュータ5を介して情報出力システム1をネットワーク11に接続することができ、ネットワーク11上に接続された他のコンピュータで作成したデータをPDP2に表示し、あるいは、情報出力システム1で作成したデータを他のコンピュータに転送することも可能になっている。

【0069】次に、コンピュータ5について説明する。ここで、図3はコンピュータ5に内蔵される各部の電気的接続を示すブロック図である。図3に示すように、コンピュータ5は、システム全体を制御するCPU12と、起動プログラム等を記録したROM13と、CPU12のワークエリアとして使用されるRAM14とがバス21を介して接続されている。また、バス21には、所定のインターフェイスを介して文字・数値・各種指示等の入力を行なうためのキーボード15と、カーソルの移動や範囲選択等を行なうためのマウス16と、記憶装置であるハードディスク17と、PDP2に接続されておりそのPDP2に対する画像の表示を制御するグラフィックス・ボード18と、ネットワーク11に接続するためのネットワーク・カード（またはモデム）19とが接続され、また、コントローラ10・スキャナ6・プリンタ7等を接続するためのインターフェイス（I/F）20も接続されている。

【0070】ハードディスク17には、オペレーティング・システム（OS）22、コントローラ10を介してコンピュータ5上で座標入力装置3を動作させるためのデバイスドライバ23、描画ソフト・ワードプロセッサソフト・表計算ソフト・プレゼンテーションソフト・キャリアレーションソフトウェア等の各種アプリケーションプログラム24等が格納されている。

【0071】また、コンピュータ5には、OS22、デバイスドライバ23や各種アプリケーションプログラム24等の各種のプログラムコード（制御プログラム）を記録した記録媒体26（フレキシブルディスク、ハードディスク、光ディスク（CD-ROM、CD-R、CD-R/W、DVD-ROM、DVD-RAMなど）、光磁気ディスク（MO）、メモ리카ードなど各種のメディアを用いることができる）に記録されているプログラムコードを読み取る装置であるプログラム読取装置25（記録媒体26の記録方式に応じて、フレキシブルディスクドライブ装置、CD-ROMドライブ装置、MOドライブ装置等の装置を用いることができる）が搭載されている。

【0072】各種アプリケーションプログラム24は、

50

(8)

特開2003-173237

13

コンピュータ5への電源の投入に応じて起動するOS 22による制御の下、CPU 12によって実行される。例えば、キーボード15やマウス16の所定の操作によって描画ソフトを起動した場合には、PDP 2にグラフィックス・ボード18を介して描画ソフトに基づく所定の画像が表示される。また、デバイスドライバ23もOS 22とともに起動され、コントローラ10を介した座標入力装置3からのデータ入力が可能になる。このように描画ソフトを起動した状態で座標入力装置3の情報入力領域3aにユーザが手指などの指示部材で文字や図形などをなぞって描いた場合、その指示部材の移動軌跡の座標情報が画像データとしてコンピュータ5に入力され、例えば、PDP 2に表示されている画面上の画像に対して指示部材の移動軌跡を結ぶラインが上書き画像として重ねて表示される。あるいは、逆に指示部材の移動軌跡を結ぶ領域の画像が消去される。そして、この画像を重ねて表示する、あるいは、画像を消去するPDP 2の画面2a上における位置は、情報入力領域3aでユーザが手指などの指示部材でなぞって描いた位置と重なるようにしている。

【0073】図や文字を上書きする場合を例に、より詳細に説明すると、コンピュータ5のCPU 12は、入力された画像データに基づいて図や文字を描画するための描画情報を生成し、入力された座標情報に基づく位置座標に合わせてグラフィックス・ボード18に設けられるビデオメモリ（図示せず）に書き込んでいく。その後、グラフィックス・ボード18が、ビデオメモリに書き込まれた描画情報を画像信号としてPDP 2に送信することにより、ユーザが書いた文字と同一の文字が、PDP 2に表示されることになる。つまり、コンピュータ5は座標入力装置3をマウス16のようなポインティングデバイスとして認識しているため、コンピュータ5では、描画ソフト上でマウス16を用いて文字を書いた場合と同様な処理が行なわれることになる。

【0074】次に、座標入力装置3について詳細に説明する。なお、本実施の形態の情報入出力システム1に適用し得る座標入力装置3としては、検出方式の異なる種々の方式のものが考えられる。例えば、指示部材がPDP 2の画面2a上（情報入力領域3a）において指し示す座標位置を、機械的、電気的に検出する座標入力装置3としてタッチパネルを挙げることができる。

【0075】しかし、以下では、より好適な例として指示部材がPDP 2の画面2a上（情報入力領域3a）において指し示す座標位置を光学的に検出する座標入力装置3について、検出方式の異なるものを5例（第1の座標入力装置3A～第5の座標入力装置3E）挙げ、その構成及び原理について説明する。

【0076】A. 第1の座標入力装置

まず、第1の座標入力装置3Aについて図4～図8に基づいて説明する。この第1の座標入力装置3Aは、いわ

14

ゆる再帰光遮蔽方式を用いるものである。

【0077】ここで、図4は第1の座標入力装置3Aの構成を概略的に示す説明図である。図4に示すように、座標入力装置3Aは、PDP 2の画面2aのサイズに対応したサイズで横長の四角形状の情報入力領域3aを備えている。この情報入力領域3aは、手指などでなぞることにより文字や図形等の入力を可能にする領域である。この情報入力領域3aの下方両端部に位置する角部の近傍には、発光と受光とを行なう光学ユニット27（左側光学ユニット27L、右側光学ユニット27R）が所定の取付角度で設けられている。これらの光学ユニット27からは、平面若しくはほぼ平面をなし、例えばL<sub>1</sub>、L<sub>2</sub>、L<sub>3</sub>、・・・、L<sub>n</sub>（R<sub>1</sub>、R<sub>2</sub>、R<sub>3</sub>、・・・、R<sub>n</sub>）といった光（プローブ光）の束で構成される扇形状で薄膜状の光束膜が、情報入力領域3aの全域に行き渡るようにPDP 2の画面2aの表面に沿って平行に投光される。

【0078】また、座標入力装置3の情報入力領域3aの下部を除く周辺部には、再帰性反射部材28が設けられている。この再帰性反射部材28は、例えば円錐形状のコーナキューブを多数配列して形成されており、入射した光をその入射角度によらずに所定の位置に向けて反射する特性を有している。例えば、左側光学ユニット27Lから投光されたプローブ光L<sub>1</sub>は、再帰性反射部材28によって反射され、再び同一光路を辿る再帰反射光L<sub>1</sub>として左側光学ユニット27Lにより受光されることになる。つまり、再帰性反射部材28によっても情報入力領域3aが形成されている。

【0079】次に、光学ユニット27について説明する。ここで、図5は光学ユニット27の構成を概略的に示す構成図である。なお、図5はx-z方向を主体に示しているが、二点鎖線で示す部分については同一の構成要素を別方向（x-y方向、又はy-z方向）から見た図である。

【0080】図5に示すように、光学ユニット27は、投光手段29と受光手段30とを備えている。投光手段29は、スポットをある程度絞ることの可能なLD（Laser Diode）、ピンポイントLED（Light Emitting Diode）等の光源31を備えている。この光源31からPDP 2の画面2aに対して垂直に照射された光は、一方向の倍率のみを変更可能なシリンドリカルレンズ32によってx方向にコリメートされる。シリンドリカルレンズ32によってx方向にコリメートされた光は、シリンドリカルレンズ32とは曲率の分布が直交する2枚のシリンドリカルレンズ33、34によりy方向に対して集光される。つまり、これらのシリンドリカルレンズ群（シリンドリカルレンズ32、33、34）の作用により、光源31からの光を線状に集光した領域がシリンドリカルレンズ34の後方に形成されることになる。ここに、y方向に狭くx方向に細長いスリットを有するスリット

15

板35を配置する。したがって、シリンドリカルレンズ群(シリンドリカルレンズ32、33、34)を通過した光は、スリット板35のスリット位置において、線状の二次光源36を形成する。二次光源36から発した光は、ハーフミラー37で折り返され、PDP2の画面2aの垂直方向には広がらずに画面2aの表面に沿った平行光で、画面2aと平行方向には二次光源36を中心にした扇形状の光束となり情報入力領域3aを進行する。換言すれば、扇形状の光が情報入力領域3aを形成する。これらのシリンドリカルレンズ群(シリンドリカル

【0081】前述したように、扇形状となって情報入力領域3aを進行した光束は、再帰性反射部材28で再帰的に反射され、再び同一光路を辿ってハーフミラー37に戻るようになる。したがって、再帰性反射部材28で再帰的に反射された光束も情報入力領域3aを形成する。

【0082】再帰性反射部材28で反射されてハーフミラー37に戻った再帰反射光は、ハーフミラー37を透過して受光手段30に入射する。受光手段30に入射した再帰反射光は、集光レンズであるシリンドリカルレンズ38を通過して線状にされた後、このシリンドリカルレンズ38から距離f(fはシリンドリカルレンズ38の焦点距離)の間隔で設けられたCCD39において、プローブ光毎に異なる位置で受光される。なお、本実施の形態のCCD39は、1次元CCDであって、その画素数は2,048画素とされている。

【0083】詳細には、再帰性反射部材28で反射された再帰反射光は、z軸方向ではシリンドリカルレンズ38の作用を受けず、コリメートされたままCCD39に到達する。また、再帰反射光は、PDP2の画面2aと平行方向では、シリンドリカルレンズ38の中心に集光するように伝播し、その結果、シリンドリカルレンズ38の作用を受けてシリンドリカルレンズ38の焦点面に設置されたCCD39上に結像する。これにより、CCD39上に再帰反射光の有無に応じて光強度の分布が形成される。すなわち、再帰反射光を指示部材Pで遮った場合、CCD39上の遮られた再帰反射光に相当する位置に光強度が弱い点(後述するピーク点)が生じることになる。再帰反射光を受光したCCD39は、再帰反射光(プローブ光)の光強度分布に基づいた電気信号を生成し、前述したコントローラ10に対して出力する。なお、図5に示すように、二次光源36とシリンドリカルレンズ38とは、ハーフミラー37に対して共に距離dの位置に配設されて共役な位置関係にある。

【0084】ここで、図6は受光素子39から再帰反射光の光強度分布に基づいた電気信号が入力され、情報入力領域3aを進行する光が遮られた位置の座標を特定する処理を実行するコントローラ10のブロック構成図で

(9)

特開2003-173237

16

ある。このコントローラ10は、光学ユニット27(左側光学ユニット27L、右側光学ユニット27R)の光源(LED)31の発光制御と、光学ユニット27(左側光学ユニット27L、右側光学ユニット27R)のCCD39からの出力の演算を行なうものである。図6に示すように、コントローラ10には、各部を集中的に制御するCPU40が設けられており、このCPU40には、プログラム及びデータを記録するROM41、各種データを書き換え自在に格納してワークエリアとして機能するRAM42、コンピュータ5に接続するためのインターフェイス43、A/Dコンバータ44及びLSDドライバ45がバス接続されている。また、CPU40には、各種のプログラムコード(制御プログラム)を格納するハードディスク46や不揮発性のメモリであるEEPROM47がバス接続されている。ここに、CPU40、ROM41及びRAM42によりマイクロコンピュータが構成されている。このようなマイクロコンピュータには、各種のプログラムコード(制御プログラム)を記録した記録媒体49、すなわち、フレキシブルディスク、ハードディスク、光ディスク(CD-ROM、CD-R、CD-R/W、DVD-ROM、DVD-RAMなど)、光磁気ディスク(MO)、メモカードなどに記録されているプログラムコードを読み取る装置であるフレキシブルディスクドライブ装置、CD-ROMドライブ装置、MOドライブ装置等のプログラム読取装置48が接続されている。

【0085】CCD39からの出力を演算する回路として、CCD39の出力端子に、アナログ処理回路51が図のように接続される。CCD39に入射した反射光は、CCD39内で光の強度に応じた電圧値を持つアナログの画像データに変換され、アナログ信号として出力される。このアナログ信号は、アナログ処理回路51で処理された後、A/Dコンバータ44によってデジタル信号に変換されてCPU40に渡される。この後、CPU40によって指示部材Pの二次元座標の演算が行なわれる。

【0086】ハードディスク46に格納された各種のプログラムコード(制御プログラム)または記録媒体49に記録された各種のプログラムコード(制御プログラム)は、コントローラ10への電源の投入に応じてRAM42に書き込まれ、各種のプログラムコード(制御プログラム)が実行されることになる。

【0087】続いて、制御プログラムに基づいてCPU40によって実行される機能について説明する。ここでは、本実施の形態の座標入力装置3の備える特長的な機能である座標検出処理について以下において具体的に説明する。

【0088】ここで、図7は座標入力装置3の情報入力領域3a内の一点を指示部材Pで指し示した一例を示す正面図である。図7に示すように、例えば、左側光学ユ

10

20

30

40

50

(10)

特開2003-173237

17

ニット27Lから照射された $L_1, L_2, L_3, \dots, L_n$ といったブロープ光で構成される扇形状の光の中で $n$ 番目のブロープ光 $L_n$ が指示部材Pによって遮られた場合、そのブロープ光 $L_n$ は再帰性反射部材28に到達することはない。

【0089】このときCCD39上の光強度分布を考える。ここで、図8はCCD39の検出動作を模式的に示す説明図である。指示部材Pが情報入力領域3a内に挿入されていなければ、CCD39上の光強度分布はほぼ一定であるが、図8に示すように指示部材Pが情報入力領域3a内に挿入されてブロープ光 $L_n$ が指示部材Pによって遮られた場合、そのブロープ光 $L_n$ は光学ユニット27のCCD39によって受光されることはないため、ブロープ光 $L_n$ に対応する光学ユニット27のCCD39上の所定の位置 $X_n$ が光強度の弱い領域（暗点）となる。この光強度の弱い領域（暗点）である位置 $X_n$ は、CCD39から出力される光強度の波形にピーク点\*

$$\theta_n = \tan^{-1} (a/f) \quad \text{----- (1)}$$

と表すことができる。ただし、 $f$ はシリンドリカルレンズ38の焦点距離である。ここで、左側光学ユニット27Lにおける $\theta_n$ を $\theta_n L$ 、 $a$ を $X_n L$ と置き換える。

【0092】さらに、図7において、左側光学ユニット27Lと情報入力領域3aとの幾何学的な相対位置関係の変換係数 $g$ により、指示部材Pと左側光学ユニット27Lとのなす角度 $\theta L$ は、(1)式で求められる $X_n L$ の関数として、

$$\theta L = g(\theta_n L) \quad \text{----- (2)}$$

$$\text{ただし、} \theta_n L = \tan^{-1} (X_n L/f)$$

と表すことができる。

【0093】同様に、右側光学ユニット27Rについて※39

$$x = w \cdot \tan \theta R / (\tan \theta L + \tan \theta R) \quad \text{----- (4)}$$

$$y = w \cdot \tan \theta L \cdot \tan \theta R / (\tan \theta L + \tan \theta R) \quad \text{----- (5)}$$

として算出することができる。

【0095】これらの(1)(2)(3)(4)(5)式は制御プログラムの一部として予めハードディスク46や記録媒体49に格納されており、(1)(2)

(3)(4)(5)式により、指示部材Pの位置座標 $(x, y)$ は、 $X_n L, X_n R$ の関数として算出される。すなわち、左側光学ユニット27LのCCD39上の暗点の位置と右側光学ユニット27RのCCD39上の暗点の位置とを検出することで、指示部材Pの位置座標 $(x, y)$ が算出されることになる。

【0096】このようにして算出された指示部材Pの位置座標 $(x, y)$ は、コントローラ10を介してコンピュータ5へと出力され、所定の処理に用いられることになる。

【0097】そして、このような座標入力装置3Aによれば、情報入力領域3aにおいて、無視差、完全透明、高い描画感を実現することが可能になっている。

【0098】B. 第2の座標入力装置

18

\*として出現することになるので、CPU40は、このような光強度の波形におけるピーク点の出現を電圧の変化により認識し、この光強度の波形のピーク点となった暗点の位置 $X_n$ を検出する。

【0090】また、光強度の波形のピーク点となった暗点位置 $X_n$ が検出されると、暗点位置 $X_n$ からCCD39の中心画素までの距離が、例えばCCD39の画素番号（例えば、図8においては、画素番号 $m$ ）に基づいて検出される。

【0091】光強度の弱い領域（暗点）である位置 $X_n$ （左側光学ユニット27LのCCD39上では $X_n L$ 、右側光学ユニット27RのCCD39上では $X_n R$ ）は、遮られたブロープ光の射出/入射角 $\theta_n$ と対応しており、 $X_n$ を検出することにより $\theta_n$ を知ることができる。即ち、暗点位置 $X_n$ からCCD39の中心画素までの距離を $a$ とすると、 $\theta_n$ は $a$ の関数として、

※も、上述の(1)(2)式中の記号 $L$ を記号 $R$ に置き換えて、右側光学ユニット27Rと情報入力領域3aとの幾何学的な相対位置関係の変換係数 $h$ により、

$$\theta R = h(\theta_n R) \quad \text{----- (3)}$$

$$\text{ただし、} \theta_n R = \tan^{-1} (X_n R/f)$$

と表すことができる。

【0094】ここで、左側光学ユニット27LのCCD39の中心位置と右側光学ユニット27RのCCD39の中心位置との距離を図7に示す $w$ とすると、情報入力領域3a内の指示部材Pで指示した点の2次元座標 $(x, y)$ は、三角測量の原理により、

次に、第2の座標入力装置3Bについて図9～図11に基づいて説明する。なお、第1の座標入力装置3Aで説明した部分と同一部分については同一符号を用い、説明も省略する。

【0099】この第2の座標入力装置3Bは、いわゆる再帰光反射方式の座標入力装置である。

【0100】ここで、図9は座標入力装置3Bに用いられる指示部材61を示す斜視図である。また、図10は座標入力装置3Bの情報入力領域3a内の一点を指示部材61で指し示した一例を示す正面図である。図9に示すように、座標入力装置3Bの情報入力領域3a内の一点を指し示すために用いられる指示部材61の先端近傍には、再帰性反射部材62が設けられている。この再帰性反射部材62は、例えば円錐形状のコーナキューブを多数配列して形成されており、入射した光をその入射角度によらずに所定の位置に向けて反射する特性を有している。例えば、左側光学ユニット27Lから投光されたブロープ光 $L_n$ は、図10に示すように、再帰性反射

(11)

特開2003-173237

19

29

部材62によって反射され、再び同一光路を通る再帰反射光し。'として左側光学ユニット27Lにより受光されることになる。そのため、図10に示すように、座標入力装置3Bにおいては、前述した座標入力装置3Aのように情報入力領域3aに再帰性反射部材28を設ける必要はない。なお、指示部材61はペン状の形状をしており、光沢のある金属製よりゴムやプラスチックなどの材質が望ましい。

【0101】したがって、このような指示部材61の再帰性反射部材62を備えた光線近傍を座標入力装置3Bの情報入力領域3aの適当な位置(x, y)に挿入し、例えば左側光学ユニット27Lから投光された扇形状の光束の中のプロープ光し。が指示部材61の再帰性反射部材62によって反射された場合、その再帰反射光し。'は左側光学ユニット27LのCCD39によって受光される。このようにしてCCD39が再帰反射光し。'を受光した場合には、再帰反射光し。'に対応するCCD39上の所定の位置Dnが光強度の強い領域(明点)となる。つまり、図11に示すように、CCD39上では位置Dnの位置に光強度が強い領域が生じ、CCD39からの光の強度分布の形状にはピークが出現する。このピークが出現する位置Dnは反射されたプロープ光の出射/入射角 $\theta_n$ と対応しており、Dnを検出することにより $\theta_n$ を知ることができる。つまり、このような再帰光反射方式の座標入力装置3Bの場合も、前述した再帰光遮蔽方式の座標入力装置3Aと同様に、光強度の波形に出現するピークに基づく三角測量の手法により指示部材61の位置座標(x, y)が算出されることになる。

【0102】このようにして算出された指示部材61の位置座標(x, y)は、コントローラ10を介してコンピュータ5へと出力され、所定の処理に用いられることになる。

【0103】そして、このような座標入力装置3Bによれば、情報入力領域3aにおいて、無視差、完全透明、高い描画感を実現することが可能になっている。なお、前記のような指示部材61を用いず、指示部材として手指などを用いることもできる。

【0104】C. 第3の座標入力装置

次に、第3の座標入力装置3Cについて図12~図14に基づいて説明する。なお、第1の座標入力装置3Aで説明した部分と同一部分については同一符号を用い、説明も省略する。

【0105】この第3の座標入力装置3Cは、第1の座標入力装置3Aにおける光学ユニットの変形例である。詳細には、第1の座標入力装置3Aで用いた光学ユニット27においては扇形状の光束を投光して情報入力領域を形成したが、座標入力装置3Cにおいては、ポリゴンミラー等の回転走査系を有しており、その回転走査系によって光源から出射された光ビームを放射状に投光し

て情報入力領域を形成する光学ユニット70を用いるものである。

【0106】ここで、図12は光学ユニット70を概略的に示す平面図である。図12に示すように、光学ユニット70は、駆動回路(図示せず)を有してレーザ光を出射する光源であるLD(Laser Diode)71とハーフミラー72とポリゴンミラー73と集光レンズ74とで構成される投光手段70aと、受光素子75とが備えられている。受光素子75は、集光レンズ74から距離f(fは集光レンズ74の焦点距離)の間隔で設けられたPD(Photo Diode)で構成されている。このような光学ユニット70は、LD71から出射したレーザ光をハーフミラー72で折り返した後、パルスモータ(図示せず)により所定の角速度 $\omega$ で回転駆動されるポリゴンミラー73によって放射状に順次反射する。したがって、光学ユニット70は、ビーム光を放射状に繰り返し投光することになる。つまり、2つの光学ユニット70から放射状に投光されるビーム光によって情報入力領域3aが形成されることになる。一方、反射されて光学ユニット70に入射したビーム光は、ポリゴンミラー73によって反射され、ハーフミラー72に到達する。ハーフミラー72に到達した反射ビーム光は、ハーフミラー72を透過して受光素子75に到達し、電気信号に変換される。

【0107】次に、このような光学ユニット70を第1の座標入力装置3Aで用いた光学ユニット27に代えて適用した座標入力装置3Cについて説明する。図13に示すように、情報入力領域3a中の或る位置に指示部材Pが挿入されてあるビーム光が遮蔽されると、そのビーム光は再帰性反射部材28で反射されることはないことから、受光素子75に到達することはない。このように情報入力領域3a中の或る位置に指示部材Pが挿入されてあるビーム光が遮蔽された場合、受光素子75からの光の強度分布の形状にはディップが出現する。

【0108】各部の電気的接続等については技術的に公知であるため詳細な説明は省略するが、図14に示すように、情報入力領域3aに指示部材Pが挿入されていない場合には光強度は" $I = I_0$ "を示すが、情報入力領域3aに指示部材Pが挿入されて受光素子75に再帰光が戻らない場合には光強度は" $I = I_0$ "を示すことになる。このように光強度が" $I = I_0$ "である部分が、ディップである。なお、図14中、時間 $t = t_0$ は、ポリゴンミラー73の回転の基準位置であって、回転走査されるビーム光が所定の角度に達した時点である。

【0109】したがって、光強度が" $I = I_0$ "となった時間 $t$ を $t_0$ であるとすれば、情報入力領域3aに挿入された指示部材Pにより遮蔽されたビーム光の出射角度 $\theta$ は、

$$\theta = \omega(t - t_0) = \omega \Delta t$$

として算出される。つまり、左右それぞれに設けられた



(12)

特開2003-173237

21

光学ユニット70(70L, 70R)において情報入力領域3aに挿入された指示部材Pにより遮蔽されたビーム光の出射角度 $\theta$ ( $\theta nL$ ,  $\theta nR$ )が算出され、それらの出射角度 $\theta$ ( $\theta nL$ ,  $\theta nR$ )に基づく三角測量の手法によって指示部材Pを挿入した位置座標(x, y)が算出されることになる。

【0110】このようにして算出された指示部材Pの位置座標(x, y)は、コントローラ10を介してコンピュータ5へと出力され、所定の処理に用いられることになる。

【0111】そして、このような座標入力装置3Cによれば、情報入力領域3aにおいて、無視差、完全透明、高い描画感を実現することが可能になっている。

【0112】D. 第4の座標入力装置

次に、第4の座標入力装置3Dについて図15～図16に基づいて説明する。なお、第2の座標入力装置3B及び第3の座標入力装置3Cで説明した部分と同一部分については同一符号を用い、説明も省略する。

【0113】この第4の座標入力装置3Dは、第2の座標入力装置3Bにおける光学ユニットの変形例である。詳細には、第2の座標入力装置3Bで用いた光学ユニット27においては扇形状の光束膜を投光して情報入力領域を形成したが、第4の座標入力装置3Dにおいては、ポリゴンミラー等の回転走査系を有しており、その回転走査系によって光源から出射された光ビームを放射状に投光して情報入力領域を形成する光学ユニット70を用いるものである。なお、光学ユニット70についての説明は、第3の座標入力装置3Cで説明したのでここでは省略する。

【0114】このような光学ユニット70を第2の座標入力装置3Bで用いた光学ユニット27に代えて適用した座標入力装置3Dについて説明する。図15に示すように、情報入力領域3a中の或る位置に指示部材61が挿入された場合、所定のビーム光が指示部材61の再帰性反射部材62において再帰反射され、そのビーム光は受光素子75に到達する。このように情報入力領域3a中の或る位置に指示部材61が挿入されてあるビーム光が再帰反射された場合、受光素子75からの光の強度分布の形状にはピークが出現する。

【0115】各部の電気的接続等については技術的に公知であるため詳細な説明は省略するが、図16に示すように、情報入力領域3aに指示部材61が挿入されていない場合には光強度は“ $I = I_0$ ”を示すが、情報入力領域3aに指示部材61が挿入されて受光素子75に再帰光が到達した場合には光強度は“ $I = I_1$ ”を示すことになる。このように光強度が“ $I = I_1$ ”である部分が、ピークである。なお、図16中、時間 $t = t_0$ は、ポリゴンミラー73の回転の基準位置であって、回転走査されるビーム光が所定の角度に達した時点である。

【0116】したがって、光強度が“ $I = I_1$ ”となっ

22

た時間 $t$ を $t_1$ であるとすれば、情報入力領域63に挿入された指示部材61により再帰反射されたビーム光の出射角度 $\theta$ は、

$$\theta = \omega(t_1 - t_0) = \omega \Delta t$$

として算出される。つまり、左右それぞれに設けられた光学ユニット70(70L, 70R)において情報入力領域3aに挿入された指示部材61により再帰反射されたビーム光の出射角度 $\theta$ ( $\theta nL$ ,  $\theta nR$ )が算出され、それらの出射角度 $\theta$ ( $\theta nL$ ,  $\theta nR$ )に基づく三角測量の手法によって指示部材61を挿入した位置座標(x, y)が算出されることになる。

【0117】このようにして算出された指示部材61の位置座標(x, y)は、コントローラ10を介してコンピュータ5へと出力され、所定の処理に用いられることになる。

【0118】そして、このような座標入力装置3Dによれば、情報入力領域3aにおいて、無視差、完全透明、高い描画感を実現することが可能になっている。

【0119】E. 第5の座標入力装置

次に、第5の座標入力装置3Eについて図17～図18に基づいて説明する。この第5の座標入力装置3Eは、情報入力領域内の画像情報を撮像カメラにより取り込んで、その取り込まれた画像情報の内の一部に基づいて位置座標を検出するいわゆるカメラ撮像方式の座標入力装置である。

【0120】ここで、図17は第5の座標入力装置3Eの構成を概略的に示す正面図である。第5の座標入力装置3Eにおける情報入力領域3aの上方両端部には、撮像手段である撮像カメラ82が距離 $w$ を隔てて設けられている。撮像カメラ82には、CCD(Charge Coupled Device)である受光素子83と結像光学レンズ84とが、距離 $f$ を隔てて設けられている。これらの撮像カメラ82の撮像画角は約90度であり、情報入力領域3aを撮影範囲とするようにそれぞれ設置されている。また、撮像カメラ82は座標入力面を形成するPDP2の画面2aから所定の距離となるように設置されており、その光軸はPDP2の画面2aに平行である。

【0121】加えて、情報入力領域3aの上部を除く周縁部であって撮像カメラ82の撮像画角を妨げずに撮影視野全体を覆う位置には、背景板85が設けられている。この背景板85は、情報入力領域3aの中央にその面を向け、PDP2の画面2aに対して略垂直に設けられる。この背景板85は、例えば一様な黒色とされている。

【0122】撮像カメラ82の信号と指示部材Pとの関係を図18に示す。図18に示すように、指示部材Pが情報入力領域3aに挿入された場合、その指示部材Pは撮像カメラ82に撮影され、指示部材Pの像が撮像カメラ82の受光素子83上に形成される。第5の座標入力装置3Eのように背景板85が黒色であって、指を指示

(13)

23

部材Pとして用いるような場合には、指示部材Pは背景板85に比べて高い反射率を有することになるので、受光素子83の指示部材Pに相当する部分は、光強度の強い領域（明点）となる。

【0123】各部の電気的接続等については技術的に公知であるため詳細な説明は省略するが、図18に示すように、情報入力領域3aに指示部材Pが挿入された場合には、受光素子83からの光の強度分布の形状にはピークが出現する。このピークが出現する位置Dnは、結像光学レンズ84の主点からの指示部材Pの見かけの角度

$\theta_n$ に対応しており、 $\theta_n$ はDnの関数として、

$$\theta_n = \arctan(D_n / f)$$

と表すことができる。つまり、このようなカメラ撮像方式の第5の座標入力装置3Eの場合も、前述した座標入力装置3A等と同様に、光強度の波形に出現するピークに基づき三角測量の手法により指示部材Pの位置座標（x, y）が算出されることになる。

【0124】このようにして算出された指示部材Pの位置座標（x, y）は、コントローラ10を介してコンピュータ5へと出力され、所定の処理に用いられることになる。

【0125】なお、指示部材Pとしては、自身が発光する発光素子付きの専用ペン等も適用することができる。

【0126】そして、このような第5の座標入力装置3Eによれば、情報入力領域3aにおいて、無視差、完全透明、高い描画感を実現することが可能になっている。

【0127】続いて、本実施の形態の情報入出力システム1において実行される各種アプリケーションプログラム24の1つである描画ソフトにおける処理の内、従来の情報入出力システムによって行なわれている処理と同様の処理についてはその説明を省略し、情報入出力システム1が備える特長的な機能に関連する機能について以下に説明する。

【0128】図19に示すように、描画ソフトでは、ユーザによる各種機能の操作を可能とするツールバー91、92が表示される。そして、このツールバー91、92に含まれるアイコン93が表示されている位置を手指などで指し示すと、座標入力装置3が、その位置の座標を検出してアイコン93がクリックされるので、様々な操作が可能となる。

【0129】しかしながら、画面2aは40インチあるいは50インチというような大画面であり、また、ツールバー91、92は、通常、画面2aの上下又は左右の端に表示するものであるから、ユーザは、アイコン93をクリックするためにいちいち四肢を大きく伸ばしたり、所望のアイコン93が表示されている位置まで歩み寄ったり、あるいは、椅子に座って操作する場合にはアイコン93をクリックするたびにわざわざ立ち上がったことが必要となり、操作が煩雑である。

【0130】そこで、描画ソフトでは、以下に説明する

特開2003-173237

24

ような各種の処理を行って、操作性を向上させている。すなわち、描画ソフトは、ユーザが手指などで画面2a上で様々な操作を行なうことに対応して、様々な操作画像を画面2a上に表示する。

【0131】ここで、操作画像とは、画面上に表示される図形であって、その図形に対してユーザが手指などで所定の動作を行なうことにより、ユーザが様々な操作（この例では、描画ソフトに関する様々な操作）を情報入出力システム1に対して行なうことを受付けるものである。

【0132】すなわち、ユーザが手指などを画面2a上で行なう動作の違いを検出し、その動作ごとに異なる操作画像を画面2a上に表示し、その表示した操作画像を介してユーザから様々な操作を受付けるものである。

【0133】図20は、かかる処理に一例ついて説明するフローチャートである。図20に示すように、手指などで画面2a上の2点、ポイントPa及びPb（図21参照）を同時に指し示したことを座標入力装置3により検出したとき（ステップS1のY）、又は、画面2a上の1点、ポイントPaを指し示したことを座標入力装置3により検出し（ステップS2のY）、この検出後、予め設定されている一定時間T以内に（ステップS3のN）、ポイントPa（図21参照）を指し示された状態のまま、他のポイントPb（図21参照）も同時に指し示されたことを座標入力装置3により検出したときは（ステップS4のY）、その検出したポイントPaとポイントPbとの座標位置の距離を算出し（ステップS5）、その距離が予め設定されている距離d以下であるときは（ステップS6のY）、この描画ソフトで使用されている各種アイコン93のうち、予めハードディスク1に格納された描画ソフトに含まれている操作画像の一例としてのアイコン94（図22参照）をポイントPbの近傍の予め設定されている所定領域に表示する（ステップS7）。ステップS7により操作画像表示手段、操作画像表示処理を実現している。ステップS3により計時手段、計時処理、第1の比較手段、第1の比較処理を実現している。ステップS5により測距手段、測距処理、ステップS6により第2の比較手段、第2の比較処理を実現している。

【0134】図22の例では、アイコン94として、ラインツールアイコン94a、イレーサアイコン94b及びスタンプアイコン94cの3つを同時に表示する例を示している。これらのアイコン94が表示されると、アイコン94と同様、アイコン94が表示されている位置を手指などで指し示すと、座標入力装置3がその位置の座標を検出して、アイコン94がクリックされるので、様々な操作が可能となる。

【0135】例えば、図22に示すアイコン94の例では、ラインツールアイコン94aは画面2a上にライン

(14)

特開2003-173237

25

を描画する機能のアイコンであり、イレーサーアイコン94bは画面2a上の画像を消去する機能のアイコンであり、スタンプアイコン94cは“機密”“マル秘”などの文字やマークを画面2a上に表示する機能のアイコンである。より具体的に説明すると、ラインツールアイコン94aをクリックすることにより、画面2a上を手指などでなぞった軌跡を座標入力装置3で検出して、その軌跡にラインを表示することができる。また、イレーサーアイコン94bをクリックすることにより、画面2a上を手指などでなぞった軌跡を座標入力装置3で検出して、その軌跡上の画像を消去することができる。さらに、スタンプアイコン94cをクリックすることにより、画面2a上の手指などで指示した位置に“機密”“マル秘”などの文字やマークを表示することができる。

【0136】このように、手指などで2点、ポイントPa、Pbを同時に指し示すことにより、ポイントPbの近傍の予め設定されている位置に所定のアイコン94を表示することができるので、ユーザMは、アイコン94をクリックするためにいちいち四肢を大きく伸ばしたり、所望のアイコン94が表示されている位置まで歩み寄ったり、あるいは、椅子に座って操作する場合にはアイコン94をクリックするたびにわざわざ立ち上がったなど煩わしい動作を行わなくても、手元にアイコン94を表示することができ、操作性を向上することができる。

【0137】アイコン94を表示するためには、手指などで画面2aの2点を同時に指し示した場合のみ（ステップS1のY、S2のY、S4のY）、アイコン94を表示するので（ステップS7）、ラインツールアイコン94aの機能により手指などでなぞった軌跡をライン表示する場合や、イレーサーアイコン94bの機能により手指などでなぞった軌跡上の画像を消去する場合のように、画面2a上の1点のみ指し示される場合とは容易に区別される。

【0138】また、一定時間T以内に2点、ポイントPa、Pbを同時に指し示す必要があるので（ステップS3のN）、ある程度の時間を空けて画面2a上の2点を指し示すようになれば、アイコン94を表示するため以外の目的である程度時間差を置いて2点を指し示す場合を区別することができる。

【0139】さらに、ポイントPa、Pb間の距離が距離d以下でないと（ステップS6のY）、アイコン94は表示されないの、距離dを片手の2本の指で指し示し得ると通常考えられる距離に設定しておけば、アイコン94を表示するため以外の目的である程度距離をおいて2点を指し示す場合を区別することができる。

【0140】なお、アイコン94として表示するアイコンの種類及び数、表示位置（ポイントPaとPbのいずれを基準とした位置かの別、ポイントPa又はPbから

26

の距離、方向、範囲）などは、画面2a上に表示する操作画面で予め設定しておくことができる。これにより受付手段、受付処理を表現する。そして、この設定がなされると、設定後のアイコン94の種類及び数、表示位置で前記の所定のテーブルの内容が更新され、以後、その内容にしたがってアイコン94が表示される。これにより更新手段、更新処理を表現する。

【0141】この場合、これらの項目を個別のユーザごとにテーブルに登録しておくこともできる。そして、各ユーザの識別は、様々な認証技術を用いて行なうことができる。例えば、ユーザの氏名やIDを画面2a上で入力する（又は選択する）、あるいは、ユーザの指紋を読み取り、これを予め登録済みの指紋と照合する（詳細については、例えば、特開2000-187419公報、特開2000-187420公報など参照）などである。さらに、ポイントPa、Pbが画面2a上の上端側にあるときはアイコン94を下側に、下端側にあるときは上側に表示し、ポイントPa、Pbが画面2a上の右端側にあるときはアイコン94を左側に、左端側にあるときは右側に表示するようにすることもできる。

【0142】前記の例では、ポイントPa、Pbの2点を画面2a上で指し示した場合にアイコン94を表示するようにしているが、画面2a上の3点以上を指し示した場合にアイコン94を表示するようにしてもよい。この場合に、何点を指し示したかにより、表示するアイコン94の種類を変えるようにしてもよい。これにより、例えば、画面2a上で2点を指し示した場合にはユーザにとって使用頻度の最も高いアイコン94を表示し、それが3点、4点と増えるにしたがって、順次、使用頻度の低いアイコン94を表示するようにすることが可能となり、手指して表示できるアイコン94の種類を増やし、その表示の切替えを容易に行なえるので、更に操作性を向上させることができる。

【0143】ところで、このような処理を行なうためには、画面2a上で指し示した2点（ポイントPa、Pb）の座標を同時に検出できるようにする必要がある。そこで、前述した座標入力装置3を用い、ポイントPa、Pbの座標を同時に検出するための技術についても説明しておく。

【0144】すなわち、再帰光遮蔽方式の座標入力装置3Aを例に説明すると、図23に示すように、情報入力領域3a内に指示部材A、Bを同時に挿入した場合には、光学ユニット27（左側光学ユニット27L、右側光学ユニット27R）のCCD（受光素子）39上に2箇所の光強度の弱い領域（暗点）が、それぞれ生じてしまうことによる。つまり、位置座標は前述したようにX、L、X、Rの関数として算出されることから、2つの指示部材A、Bを情報入力領域3a内に同時に挿入した場合には、指示部材Aと右側光学ユニット27Rとのなす角度 $\theta R_1$ と指示部材Bと右側光学ユニット27Rと

(15)

27

のなす角度 $\theta R_2$ とが算出されるとともに、指示部材Aと左側光学ユニット27Lとのなす角度 $\theta L_1$ と指示部材Bと左側光学ユニット27Lとのなす角度 $\theta L_2$ とが算出され、合計4つの位置座標が算出されることになる。

【0145】しかしながら、このように2つの指示部材によって情報入力領域3a内が同時に指示されて合計4つの位置座標が算出された場合であっても、2つの指示部材によって指示された位置座標を検出することは可能である。以下において、算出された複数個の位置座標の中から複数の指示部材による実際の遮蔽点（反射点）の位置座標を判定する実像判定処理について説明する。

【0146】ここで、図24は実像判定処理を含む処理の流れを概略的に示すフローチャート、図25は情報入力装置3Aにおける複数の位置座標が算出される状態を示す説明図である。なお、図21において、“A1、A2、A3、A4”は一方の指示部材で指示した実像の座標軌跡、“B1、B2、B3、B4”は他方の指示部材で指示した実像の座標軌跡を示すものである。また、“C1、C2、C3、C4”および“D1、D2、D3、D4”は、虚像である。

【0147】本実施の形態においては、座標が算出されると、まず、算出座標が5つ以上であるか否かが判断される（図24に示すステップS14）。算出座標が5つ以上である場合には（図24に示すステップS14のY）、3以上の指やペン等の指示部材が情報入力領域3a内に同時に挿入されたものであるため、以後の判断は行なわない。

【0148】一方、算出座標が5つ以上でない場合には（図24に示すステップS14のN）、情報入力領域3a内に挿入された指示部材は1つまたは2つであることから、続くステップS15において、算出座標が1つであるか否かが判断される。

【0149】例えば指示部材が情報入力領域3a内に同時に2つ挿入され、4つの位置座標（図25に示すA1、B1、C1、D1）が算出された場合、算出座標が1つではないので（ステップS15のN）、複数の位置座標の中から複数の指示部材による実際の遮蔽点の位置座標を抽出する座標抽出処理が実行される。なお、特に図示しないが、指示部材が情報入力領域3a内に同時に2つ挿入された場合において、その挿入位置が一の光学ユニット27に対して一直線上に並ぶ場合には、算出される位置座標は2つである。

【0150】座標抽出処理としては、まず、算出された複数の位置座標（A1、B1、C1、D1）をRAM14等のメモリに記憶する（ステップS16）。

【0151】続くステップS17においては、メモリに記録された複数の位置座標（A1、B1、C1、D1）の内、実像として確定した位置座標が有るか否かが判定される。

特開2003-173237

28

【0152】実像として確定した位置座標が無い場合には（ステップS17のN）、ステップS18に進み、実像判定に必要な時系列的に順次得られる複数回の算出座標がメモリに記憶されているか否かを判定する。

【0153】複数回の算出座標がメモリに記憶されている場合には（ステップS18のY）、ベクトル長・変位長・変位方向の初期判定条件（実験値）を設定した後（ステップS19）、ステップS20に進み、実像判定処理を実行する。

【0154】ここで、図26は実像判定処理の流れを概略的に示すフローチャートである。実像判定処理は、図26に示すように、まず、ステップS51において、所定の算出座標を起点座標とし、座標間の座標ベクトル値及び座標ベクトル長を算出して、サンプリングされた位置座標毎にRAM14等のメモリに記憶する。

【0155】ここで、座標ベクトル値の算出方法について図27を参照して説明する。図27において、前回検出された位置座標を（X1、Y1）、今回得られた位置座標を（X2、Y2）とする。X座標方向の変化量 $\Delta X = X2 - X1$ 、Y座標方向の変化量 $\Delta Y = Y2 - Y1$ から、座標ベクトル値を $\Delta Y / \Delta X$ により算出する。この場合の座標ベクトル値は、図28に示すRAM42に格納されるベクトルテーブルTBに、X軸方向から10度間隔で数値化されて予め格納されている。なお、この間隔（10度）は任意に設定すればよい。また、座標ベクトル値は、算出結果の近似値を用いるものとする。例えば、 $-\Delta Y$ 、 $-\Delta X$ で $\Delta Y / \Delta X = 0.900$ の場合であれば、座標ベクトル値=24となる。

【0156】また、図27において示すように、各サンプリングにおける座標間の座標ベクトル値は上述のように算出され、各座標間の座標ベクトル長Lは、例えば、座標（X1、Y1）、（X2、Y2）間の座標ベクトル長L1であれば、

$$L1 = \sqrt{\{(Y2 - Y1)^2 + (X2 - X1)^2\}}$$

により算出される。このようにして、サンプリングされた位置座標毎にその座標ベクトル値とその座標ベクトル長とがそれぞれ算出される。

【0157】つまり、ステップS51においては、時系列的に順次得られる位置座標間の変化する方向とその変化分を示す長さについて、ベクトルテーブルTBに予め設定格納されているベクトルデータを用いてベクトル座標化する処理を実行するものである。

【0158】続いて、ステップS52に進み、ステップS51で算出した座標ベクトル長が、座標検出周期（サンプリング信号に伴う所定の時間間隔）内において移動不可能な異常な座標ベクトル長（異常ベクトル長）であるか否かが判定される。なお、本実施の形態における座標検出周期は、20msとする。つまり、ステップS52は、ステップS51で算出した座標ベクトル長が座標検出周期（20ms）内に検出される長さより長い場合

(15)

29

には、実際には移動不可能であることから、その座標軌跡は、異常な座標ベクトル長（異常ベクトル長）であって実像軌跡ではないものと判定するものである。

【0159】座標ベクトル長が異常ベクトル長である場合には（ステップS52のY）、ステップS53に進み、異常ベクトル長を判定した座標ベクトル長の数が検知された位置座標数に達したか否かが判定され、検知された位置座標数に達していなければ（ステップS53のN）、終点の位置座標を変更して（ステップS54）、再びステップS51においてその終点に基づく座標ベクトル値と座標ベクトル長とを算出する。

【0160】つまり、ステップS51～S52の処理は、座標ベクトル長が異常ベクトル長でないと判定されるまで（ステップS52のN）、または、全ての終点の位置座標についての座標ベクトル長が異常ベクトル長であると判定されるまで（ステップS53のY）、繰り返される。

【0161】したがって、例えば位置座標A1を起点座標とした場合について説明すると、図25に示すようにその直後に算出される位置座標はA2、B2、C2、D2であることから、これらの位置座標（A2、B2、C2、D2）の中から一つずつ位置座標が終点として選択され、

A1→A2、A1→B2、A1→C2、A1→D2の何れか一つに係る座標ベクトル値（起点ベクトル値）とその座標ベクトル長（起点ベクトル長）とが順次算出され、実像軌跡であるか否かが順次判定されることになる。

【0162】なお、全ての終点の位置座標についての座標ベクトル長が異常ベクトル長であると判定された場合には（ステップS53のY）、実像の鑑定ができないことになるので、後述するステップS21に進む。

【0163】一方、座標ベクトル長が異常ベクトル長でないと判定された場合には（ステップS52のN）、その終点の位置座標をRAM14等のメモリに記憶し（ステップS55）、所定の初期設定（ $n=3$ （ $n$ ：座標検出周期回数））を実行する（ステップS56）。

【0164】続くステップS57においては、ステップS55においてメモリに記憶した起点ベクトルの終点の位置座標を起点座標とし、 $n$ 番目の座標検出周期において検出された位置座標との座標間の座標ベクトル値及び座標ベクトル長を算出し、RAM14等のメモリに記憶する。

【0165】続いて、ステップS58に進み、ステップS57で算出した座標ベクトル長が、座標検出周期内において移動不可能な異常な座標ベクトル長（異常ベクトル長）であるか否かを判定する。

【0166】座標ベクトル長が異常ベクトル長でないと判定された場合には（ステップS58のN）、ステップS59に進み、実像軌跡であるものとされたA1→A2

特開2003-173237

30

の座標軌跡とA2→A3の座標軌跡とを比較し、座標ベクトル値が特定の変位置（V）内にあり、且つ、座標ベクトル長が特定の変位置（L）外である軌跡（異常変位長）であるか否かを判定する。

【0167】このように座標ベクトル値が特定の変位置（V）内にあり、且つ、座標ベクトル長が特定の変位置（L）外である軌跡（異常変位長）であるか否かを判定するのは、図29に示すように、一般的に直線を描く場合には、座標ベクトル値、同一時間内における座標ベクトル長はほぼ同じであり、また、特に図示しないが、曲線を描く場合においても、座標ベクトル値は変化するが変化量は略同一であって座標ベクトル長も略同一となることに起因している。つまり、直線または曲線上に検出物が移動する場合には、座標ベクトル長および座標ベクトル値に大きな差は生じないことから、座標ベクトル値が特定の変位置（V）内であっても、座標ベクトル長が特定の変位置（L）外である軌跡（異常変位長）については、排除するものである。

【0168】異常変位長でないと判定された場合には（ステップS59のN）、ステップS60に進み、実像軌跡であるものとされたA1→A2の座標軌跡とA2→A3の座標軌跡とを比較し、座標ベクトル値が特定の変位置（V）外にあり、且つ、座標ベクトル長が減少している軌跡（異常変位方向）であるか否かを判定する。

【0169】このように座標ベクトル値が特定の変位置（V）外にあり、且つ、座標ベクトル長が減少している軌跡（異常変位方向）であるか否かを判定するのは、図30に示すように、一般的に直線方向を大きく変化させて描く場合には、方向転換する描画速度は順次低減して方向転換点で停止状態となり、再び転換方向に通常の速度で描きはじめることになるので、座標ベクトル値が大きく変化する場合には、座標ベクトル長は逐次減少した後、変換方向に向かって増加することによって起因している。つまり、検出物が大きく方向を変える場合には、直前に動作の停止状態が発生することから、座標ベクトル長が減少していても、座標ベクトル値が特定の変位置（V）外である軌跡（異常変位方向）については、排除するものである。

【0170】異常変位方向でないと判定された場合（ステップS60のN）、言い換えれば異常ベクトル長でも異常変位長でも異常変位方向でもない場合には、その終点の位置座標をRAM14等のメモリに記憶し（ステップS61）、座標検出周期回数 $n$ を“1”インクリメントする（ステップS62）。

【0171】その後、ステップS63において、座標検出周期回数 $n$ がメモリに記憶されている実像判定に必要な時系列的に順次得られる複数回分の算出座標の数（判定座標数）を超えたか否かが判定され、座標検出周期回数 $n$ が判定座標数を超えていない場合には（ステップS63のY）、前述した連続ベクトルを起点ベクトルとし

(17)

特開2003-173237

31

(ステップS64)、再びステップS57においてその終点に基づく座標ベクトル値と座標ベクトル長とを算出する。

【0172】つまり、ステップS57～S64の処理は、全ての終点の位置座標について異常ベクトル長または異常変位長若しくは異常変位方向であると判定されるまで(ステップS65のY)、終点の位置座標を変更し(ステップS66)、繰り返される。

【0173】そして、全ての終点の位置座標について異常ベクトル長または異常変位長若しくは異常変位方向であると判定された場合には(ステップS65のY)、再びステップS64に進み、終点の位置座標を変更し、ステップS51においてその終点に基づく座標ベクトル値と座標ベクトル長とを算出する。

【0174】したがって、例えば、ステップS55においてメモリに記憶した起点ベクトルの終点の位置座標がA2であって、A1→A2が実像軌跡であるものとされた場合、図25に示すようにその直後に算出される位置座標はA3、B3、C3、D3であることから、これらの位置座標(A2、B2、C2、D2)の中から一つずつ位置座標が終点として選択され、

A2→A3、A2→B3、A2→C3、A2→D3の何れか一つに係る座標ベクトル値(継続ベクトル値)とその座標ベクトル長(継続ベクトル長)とが順次算出され、実像軌跡であるか否かが順次判定されることになる。

【0175】一方、座標検出周期回数nが判定座標数を超えたと判定された場合には(ステップS63のY)、実像が確定したことになるので、その位置座標をインターフェイス43を介してコンピュータ5に転送し(ステップS67)、指示部材による指示位置の表示や指示位置に対応するコマンド入力などの処理に利用することになる。

【0176】ここで、一の位置座標に基づく他の位置座標についての実像か否かの判定について図23を参照して説明する。一の位置座標に基づく他の位置座標についての実像か否かの判定は、図23において、AとA'とがいずれも実像であるものとする。②の方向には座標は検出されないことになる。このため、AとA'とのいずれか一方が実像であることがわかる。また、同様に、BとB'とのいずれか一方が実像であることがわかる。つまり、同一方向に存在する位置座標は、何れか一方のみが実像であって、他方は虚像であることになる。また、一方のAが実像であるとわかった場合には、他方のA'は虚像として認識されるとともに、③方向のB'も虚像として認識されることになるので、Bが実像であることがわかる。つまり、メモリに記憶された四つの位置座標の内、一の位置座標について実像か虚像かが認識されれば、全ての位置座標についての実像か虚像かの判定が可能であることがわかる。したがって、算出された全

32

ての位置座標について実像判定を行なう必要はないので、複数箇所を同時に指示した場合の位置座標を低コストで検出することが可能になる。

【0177】なお、図31に示すように、メモリに記憶された複数個の位置座標(A1、B1、C1、D1)の内、一の位置座標(図31においてはB1)が情報入力領域3aの外に存在してしまう場合には、A1とC1とを実像として確定することができることになる。

【0178】すなわち、メモリに記憶された四つの位置座標の内、一の位置座標について実像か虚像かが認識されれば、全ての位置座標についての実像か虚像かの判定が可能であることにより、他方の位置座標も実像として確定し(ステップS68)、インターフェイス43を介してコンピュータ5に転送する(ステップS69)。また、ステップS67～S69の処理は、判定座標数全てについて確定するまで(ステップS70のY)、繰り返される。そして、判定座標数全てについての実像の位置座標の送信が終了した場合に(ステップS70のY)、実像判定処理は終了し、ステップS14に戻る。

【0179】次に、ステップS53において全ての終点の位置座標についての座標ベクトル長が異常ベクトル長であると判定された場合の処理について説明する。全ての終点の位置座標についての座標ベクトル長が異常ベクトル長であると判定された場合には(ステップS53のY)、前述したように実像の確定ができないものとしてステップS21に進むが、このステップS21においては、まだ同一方向の位置座標(例えば、図25においてA1に対するC1)についての実像判定処理を実行しているかないかを判定する。まだ同一方向の位置座標についての実像判定処理を実行していない場合には(ステップS21のN)、起点座標を変更して(ステップS22)、再度ステップS20に進み、実像判定処理を実行する。一方、同一方向の位置座標についての実像判定処理を実行している場合には(ステップS21のY)、ステップS19で設定したベクトル長・変位長・変位方向の判定条件を変更し(ステップS23)、再度ステップS20に進み、実像判定処理を実行する。つまり、同一方向の2点の位置座標について、交互に同条件にて実像判定を繰り返すことになる。

【0180】また、算出された位置座標が1つである場合には(ステップS15のY)、その算出された位置座標をインターフェイス43を介してコンピュータ5に転送するとともに(ステップS24)、RAM14等のメモリに記憶し(ステップS25)、ステップS14に戻る。

【0181】次に、ステップS17において、実像として確定した位置座標が有ると判定された場合について説明する。実像として確定した位置座標が有る場合には(ステップS17のY)、ステップS26に進む。

【0182】ここで、実像として確定した位置座標が有

(18)

特開2003-173237

33

る場合とは、前述したように算出された位置座標が複数ではない場合の位置座標がRAM14等のメモリに複数記憶されている場合であって、例えば図32に示すような場合である。図32は、一の指示部材で記述している途中において、他の指示部材が情報入力領域3a内に挿入された状態を示している。なお、実像として確定した位置座標が有る場合とは、前述したような処理により2点の座標が確定している場合を含むことは言うまでもない。

【0183】ステップS26においては、実像として確定した位置座標の前回および前々回の値に基づき、座標間の座標ベクトル値（実像ベクトル値）及び座標ベクトル長（実像ベクトル長）を算出して、RAM14等のメモリに記憶する。

【0184】その後、ベクトル長・変位長・変位方向の初期判定条件（実験値）を設定した後（ステップS27）、ステップS26においてメモリに記憶した実像ベクトルの終点の位置座標を起点座標とし、複数個同時に検出された位置座標との座標間の座標ベクトル値及び座標ベクトル長を算出し、RAM14等のメモリに記憶する。

【0185】続いて、ステップS29に進み、ステップS28で算出した座標ベクトル長が、座標検出周期内において移動不可能な異常な座標ベクトル長（異常ベクトル長）であるかを判定する。

【0186】座標ベクトル長が異常ベクトル長でないと判定された場合には（ステップS29のN）、ステップS30に進み、実像軌跡であるものとされたA3→A4の座標軌跡と例えばA4→Aの座標軌跡とを比較し、座標ベクトル値が特定の変位量（V）内にあり、且つ、座標ベクトル長が特定の変位量（L）外である軌跡（異常変位長）であるかを判定する。

【0187】異常変位長でないと判定された場合には（ステップS30のN）、ステップS31に進み、実像軌跡であるものとされたA3→A4の座標軌跡と例えばA4→Aの座標軌跡とを比較し、座標ベクトル値が特定の変位量（V）外にあり、且つ、座標ベクトル長が減少している軌跡（異常変位方向）であるかを判定する。

【0188】異常変位方向でないと判定された場合（ステップS31のN）、言い換えれば異常ベクトル長でも異常変位長でも異常変位方向でもない場合には、その終点の位置座標をRAM14等のメモリに記憶し（ステップS32）、その位置座標をインターフェイス43を介してコンピュータ5に転送するとともに（ステップS33）、他方の位置座標も実像として確定し（ステップS34）、インターフェイス43を介してコンピュータ5に転送する（ステップS35）。

【0189】一方、座標ベクトル長が異常ベクトル長であると判定された場合（ステップS29のY）、異常変

34

位長であると判定された場合（ステップS30のY）、異常変位方向であると判定された場合には（ステップS31のY）、検出座標数に達するまで（ステップS36のY）、検出座標を変更し（ステップS37）、ステップS28～S31の処理を繰り返す。

【0190】したがって、例えば、ステップS26においてメモリに記憶した実像ベクトルの終点の位置座標がA4である場合、図32に示すようにその直後に算出される位置座標はA、B、C、Dであることから、これらの位置座標（A、B、C、D）の中から一つずつ位置座標が終点として選択され、A4→A、A4→B、A4→C、A4→Dの何れか一つに係る座標ベクトル値（軌跡ベクトル値）とその座標ベクトル長（軌跡ベクトル長）とが順次算出され、実像軌跡であるか否かが順次判定されることになる。つまり、実像であると判定された一の位置座標の軌跡を追跡することで、受光素子に対して同一方向に位置する他の位置座標を虚像であると認識し、他の実像である位置座標を確定するものである。

【0191】また、検出座標数に達した場合には（ステップS36のY）、ステップS27で設定したベクトル長・変位長・変位方向の判定条件を変更し（ステップS38）、再度ステップS28に進み、座標ベクトル値（軌跡ベクトル値）とその座標ベクトル長（軌跡ベクトル長）とを算出する。

【0192】以上のような処理により、2つの指示部材によって情報入力領域3a内が同時に指示されて合計4つの位置座標が算出された場合であっても、2つの指示部材によって指示された位置座標を検出することができ、これら2つの位置座標を有効とすることができる。

【0193】次に、画面2aに表示する操作画像の別の例について説明する。

【0194】まず、図33に示すように、画面2a上の3点を同時に指し示したときは、その3点の近傍の予め設定されている位置に操作画像であるダイヤル101を表示する（図33（a））。このダイヤル101の画像は予めハードディスク17の描画ソフトに含まれているものである。そして、画面2a上の指し示している3点の位置を移動し、ダイヤル101を回転操作すると、ダイヤル101の画像も回転移動して、ダイヤル101を回転操作することができる（図33（b））。このダイヤル101は、回転操作することで、情報入出力システム1に対する所定の操作を行なうことを可能とする。この例では、操作画像がダイヤルであるため、情報入出力システム1で音声を出力する場合の音声ボリュームの調整など、一定の物理量等の段階的又は無段階的な調整に好適である。

【0195】このダイヤル101に関する処理は、具体的に後述のようにして行なう。図34は、この場合の処理を説明するフローチャートである。まず、画面2a上の3点が同時に指し示されていることを検出する（ステ



(19)

特開2003-173237

35

ップS71のY)。図23以下を参照して説明した処理では、画面2a上で指し示された3点以上の座標を同時に検出することはできないが、この例では、画面2a上の3点が同時に指し示されていることを検出できればよく、その3点の正確な座標は特定できる必要はない。すなわち、図23以下の例でも、画面2a上の3点が指し示されているときには、3点の実像及び6点の虚像の合計9点が検出されるので、これにより、実際に指し示されているのは3点であることは検出できる（その3点の\*

$$\begin{aligned} x0 &= (xa + xb + xc + x1 + x2 + x3 + x4 + x5 + x6) / 9, \\ y0 &= (ya + yb + yc + y1 + y2 + y3 + y4 + y5 + y6) / 9 \end{aligned}$$

の演算を行って、中点Cの座標(x0, y0)を求め

る。  
【0198】そして、この中点C(x0, y0)の位置を中心として、ダイヤル101の画像を表示する（ステップS73）。

【0199】そして、9点Pa~Pc、G1~G6の中で、位置の移動があったときは（ステップS74のY）、図36に示すように、9点Pa~Pc、G1~G6の中で1点を注目点として特定し（この例では点Pa）、位置の移動の際に注目点が一番近い検出点を、注目点の移動点として（この例では点Pa'）として表示し、中点Cを円の中心として、注目点Pa(xa, ya)と移動点Pa'(xa', ya')の2点から当該円の回転角度θmを算出する（ステップS75）。ステップS74により移動検出手段、移動検出処理を実現している。

【0200】すなわち、  
移動距離 $L = \sqrt{(xa' - xa)^2 + (ya' - ya)^2}$   
半径 $r = \sqrt{(xa - x0)^2 + (ya - y0)^2}$   
を求めて（図37も参照）、この結果から、  
回転角度 $\theta m = (360 \times L) / (2 \times \pi \times r)$   
（但し、πは円周率）  
を求める。

【0201】そして、回転角度θmに応じてダイヤル101の画像を中点Cを中心に回転して表示し（ステップS76）。ステップS73、S75、S76により、操作画像表示手段、操作画像表示処理を実現している。また、回転角度θmに応じた操作を受け付けて実行する（ステップS77）。ステップS77により操作手段、操作処理を実現している。すなわち、前述のようにダイヤル101が音声ボリュームを操作するときは、回転角度θmの大きさに応じて音声ボリュームを操作することになる。画面2a上の3点が指し示されなくなったときは（ステップS78のY）、ダイヤル101の表示を消去する（ステップS79）。

【0202】画面2aに表示する操作画像の別の例について説明する。

36

\* 正確な位置は検出できなくても）。

【0196】図35の例では、実像の3点Pa、Pb、Pc及び虚像の6点G1~G6が検出されている。そして、この9点の各座標Pa(xa, ya)、Pb(xb, yb)、Pc(xc, yc)、G1(x1, y1)~G6(x6, y6)の中点Cの座標を求める（ステップS72）。

【0197】すなわち、

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【0203】図38に示すように、片手の5本の指などで画面2a上の5点を同時に指し示したときは、その5点の近傍の予め設定されている位置に画102を表示する（図38(a)）。そして、そのまま指し示した5点の位置を下方（又は上方）に移動させると、5点の位置の移動に伴って徐々に画102が開き、画102の下に操作画像であるパレット103が現れる（図38(b)）。画102、パレット103の画像は予めハードディスク17の描画ソフトに含まれているものである。

そして、パレット103上でユーザがそれぞれ異なる1点を順次指し示すことにより、パレット103上で様々な操作を入力することができる。この例では、まず、画102を表示し、その後、画102の下に操作画像であるパレット103を表示するものである。画面2a上を指し示しただけで直ちに表示させたくない操作画像、例えば、初期設定値を変更する入力を行なうための操作画像を表示させる場合等に好適である。

【0204】このパレット103に関する処理は、具体的には次のようにして行なう。図39は、この場合の処理を説明するフローチャートである。まず、画面2a上の5点が同時に指し示されていることを検出する（ステップS81のY）。この例でも5点の正確な座標は特定できる必要はなく、画面2a上の5点が指し示されているときには、5点の実像及び20点の虚像の合計25点が検出されるので、これにより、実際に指し示されているのは5点であることは検出できる。

【0205】そして、ここでも(6)と同様の演算を行って、合計25点の中点Cの座標(x0, y0)を求める（図40参照）（ステップS82）。そして、中点Cを中心として画102の画像を画面2aに表示する（ステップS83）。ステップS83により、画表示手段、画表示処理を実現している。

【0206】その後、ユーザが指し示している5点の位置を、そのまま下方にドラッグし、5点の位置の移動があったときは（ステップS84のY）、中点Cの位置も下方に移動するが、そのドラッグ方向と一致するわけではない。ステップS84により、移動検出手段、移動検出処理を実現している。必要なのは下方への移動距離で

(20)

特開2003-173237

37

あるため、移動前のC点の座標を $(x_0, y_0)$ 移動後のC点の座標を $(x_1, y_1)$ とすると、 $l = y_1 - y_0$ により、下方への移動距離 $l$ を求め(図41参照)(ステップS85)。その移動距離 $l$ 分だけ画102の画像を下げて表示し、また、最初の画102の位置にパレット103を表示する(ステップS86)。ステップS86により、扉変更手段、扉変更処理、操作画像表示手段、操作画像表示処理を實現している。このパレット103の表示は画102の位置と被らない部分の画像だけを表示し、画102の下から徐々にパレット103が出現するかのようにする。

【0207】そして、パレット103の操作がなされたときは(ステップS87のY)、その操作(例えば、前述のように初期設定値の変更)を受けて実行し(ステップS88)、パレット103上でパレット103の表示の終了が指示されたときは(ステップS89のY)、画102、パレット103の表示を終了する(ステップS90)。ステップS88により、操作手段、操作処理を實現している。

【0208】画面2aに表示する操作画像の別の例について説明する。

【0209】図42に示すように、画面2a上で同時ではなく順次に3点を同時に指し示したときは、その3点の近傍の予め設定されている位置に操作画像であるパレット104を表示する。パレット104の画像はハードディスク17に格納されている描画ソフトに含まれている。この場合には、前述の例のように画102のドラッグによりパレット103が徐々に姿をあらわすのではなく、パレット104は直ちに表示されるものであるため、画面2a上を指し示しただけで直ちに表示させたい操作画像の表示に好適である。

【0210】図43に示すように、この場合の処理は、1点(ポイントA)を検出した後(図44参照)(ステップS91のY)、この1点を維持したまま所定時間内に別の1点(ポイントB)を検出し(図45参照)(ステップS92のY)、さらに、これら2点を維持したまま別の1点(ポイントC)を検出すると(図46参照)(ステップS93のY)、これら3点の近傍の予め設定されている位置にパレット104を表示するものである(ステップS94)。ステップS94により操作画像表示手段、操作画像表示処理を實現している。

【0211】この場合、前述と同様に3点の実像と6点の虚像の中心を求めて、当該中心の所定方向、所定距離の位置にパレット104を表示してもよいが、3点(ポイントA、B、C)の正確な座標を検出することも容易に行なえるので、その3点の正確な座標からパレット104の表示位置を決定するようにしてもよい。

【0212】すなわち、図45に示すように、ポイントAを指示したままポイントBを指示すると、ポイントA、B、C、Dが検出されるが、A点は実像であること

38

が当初からわかっている(図44)。仮にポイントCが2点目の実像であるとする、ポイントB、Dは検出されないはずで、また、ポイントDが2点目の実像であるとする、ポイントB、Cは検出されないはずであるため、B点が2点目の実像と判定される。次に、図46に示すように、ポイントA、Bが確定しているとする、仮にポイントHが3点目の実像であれば、ポイントI、F、D、C、Eは検出されないで、ポイントHは虚像と判定される。同様の判断を繰り返して、ポイントA、B、Cが実像であると判定される。

【0213】パレット104の表示(ステップS94)後、パレット104の操作がなされたときは(ステップS95のY)、その操作(例えば、前述のように初期設定値の変更)を受けて実行し(ステップS96)、パレット104上でパレット104の表示の終了が指示されたときは(ステップS97のY)、パレット104の表示を終了する(ステップS98)。

【0214】画面2aに表示する操作画像の別の例について説明する。

【0215】図47に示すように、画面2a上で一点(ポイントPa)を指し示し、この状態で2点目(ポイントPb)を指し示して、この2点目の位置を上下に移動すると、2点目の指し示している位置に操作画像であるスライダーバー105を表示する。スライダーバー105の画像は、ハードディスク17内の描画ソフトに含まれている。このスライダーバー105も、ダイヤル101の場合と同様、情報入力システム1で音声を出力する場合の音声ボリュームの調整など、一定の物理量等の段階的又は無段階的な調整に好適である。

【0216】図48に示すように、この場合の処理は、1点(ポイントA)を検出した後(図49参照)(ステップS101のY)、この1点を維持したまま所定時間内に別の1点(ポイントB)を検出し(ステップS102のY)、この後、最初の1点(ポイントA)の指示を維持したまま2点目(ポイントB)の移動を検出したときに(ステップS103のY)、2点目(ポイントB)の位置にスライダーバー105の画像を表示することで行なう(ステップS104)。ステップS103により、移動検出手段、移動検出処理を、ステップS104により、操作画像表示手段、操作画像表示処理を實現している。

【0217】ポイントA、Bの正確な座標位置の検出は、図23以下を参照して前述した技術を用いて行なうことができる。これにより、ポイントA～Dのうち、ポイントA、Bが実像であると判定することができる。そして、ポイントBの位置が移動したときに、元のポイントBの位置の座標を $(x_0, y_0)$ (図49参照)、移動後のポイントBの位置の座標を $(x_1, y_1)$ (図50参照)とすると、 $l = y_1 - y_0$ により、垂直方向の移動距離を求めることができるので、距離 $l$ だけ垂

39

直方向に移動した位置にスライダバー105の画像を表示することができる。

【0218】そして、移動した距離1に応じた操作（音声ボリュームの調整等）を受けて実行する（ステップS105）。ステップS105により、操作手段、操作処理を表現している。その後、ポイントA、Bの2点同時の検出がなされなくなったときは（ステップS106のY）、スライダバー105の表示を消去する（ステップS107）。

【0219】以上、様々な操作画像の例について説明した。次に、画面2a上での指示に応じて、これらの操作画像の別を判断して適切な操作画像を表示するための処理について説明する。

【0220】図51に示すように、画面2a上で2点を順次検出して（ステップS111のY）、後に検出した1点を移動させたときは（ステップS112のY）、図48を参照して前記した処理処理に移行し（ステップS113）、スライダバー105（図47参照）を表示する。この場合に、後に検出した1点の移動がないときは（ステップS112のN）、図20を参照して前記した処理に移行し（ステップS114）、アイコン94（図22参照）を表示する。

【0221】画面2a上で2点を同時に検出したときも（ステップS115のY）、図20を参照して前記した処理に移行し（ステップS114）、アイコン94（図22参照）を表示する。

【0222】画面2a上で3点を順次検出したときは（ステップS116のY）、図43を参照して前記した処理に移行し（ステップS117）、バレット104を表示する（図42参照）。

【0223】画面2a上で3点を同時に検出したときは（ステップS118のY）、図34を参照して前記した処理に移行し（ステップS119）、ダイヤル101を表示する（図33参照）。

【0224】画面2a上で5点を同時に検出したときは（ステップS120のY）、図39を参照して前記した処理に移行し（ステップS121）、バレット103を表示する（図38参照）。ステップS111～S121の処理により、操作画像表示手段、操作画像表示処理を表現している。

【0225】以下では、その他の操作画像の表示例について簡単に説明する。

【0226】図52に示すように、画面2a上で2点（ポイントA、B）を順次指し示したときに、その2点間に操作画像である所定のオブジェクト106を表示し、このポイントA、Bの距離を拡大、縮小させるように、ポイントA、Bの位置を移動させたときに、その移動距離の大きさに応じて、オブジェクト106の大きさを拡大、縮小して表示するようにしてもよい。オブジェクト106は、例えば前述したアイコン94などであ

(21)

特開2003-173237

40

る。

【0227】図53は、この場合のフローチャートである。すなわち、1点（ポイントA）を検出した後（ステップS131のY）、この1点を維持したまま所定時間内に別の1点（ポイントB）を検出し（ステップS132のY）、この後、ポイントA、Bを移動したときは（ステップS133のY）、オブジェクト106を表示して（ステップS134）、ポイントAとポイントBとの最初の距離1aと、移動後の距離1bとの差を求め、その距離1aと距離1bとの距離差1cを求めて（ステップS135）、その距離差1cの大きさに応じてオブジェクト106を拡大、縮小する（ステップS136）。ステップS133により、移動検出手段、移動検出処理を、S134により、操作画像表示手段、操作画像表示処理を、ステップS136により、拡大縮小手段、拡大縮小処理を表現している。

【0228】図42～図46を参照して前述した例では、ポイントA、B、Cを順次検出したときにバレット104を表示するようにしているが、図54に示すように、1点（ポイントA）の検出後、この1点の検出を維持したまま他の3点（ポイントB、C、D）を同時に検出したときに、バレット104を表示するようにしてもよい。

【0229】さらに、図47～図50を参照して前述した例では、ポイントBにスライダバー105が表示されて、ポイントBの移動に伴ってスライダバー105が移動するようにしているが、図55に示すように、ポイントA、Bにまたがってスライダバー105を表示し、ポイントA、Bの上下移動に伴ってスライダバー105が移動するようにしてもよい。

【0230】

【発明の効果】請求項1、12に記載の発明は、片手の手指などで画面上の複数箇所を指し示すだけの簡単な操作により、その指し示した位置の近傍等に必要な操作画像を表示することができるので、すぐ手元の画面上で操作画像を操作することができ、操作性を向上させることができる。しかも、画面上の1箇所を指し示す場合には操作画像の表示はないので、1箇所を指し示すことで行なう操作とは容易に区別することができる。

【0231】請求項2、13に記載の発明は、請求項1、12に記載の発明において、ある程度の時間間隔をあけて画面上の複数箇所を順次指し示したときは操作画像を表示しないので、操作画像の表示を目的とせずに画面上の複数箇所を指し示す場合を容易に区別することができる。

【0232】請求項3、14に記載の発明は、請求項1、2、12又は13に記載の発明において、ある程度の距離間隔をあけて画面上の複数箇所を指し示したときは操作画像を表示しないので、操作画像の表示を目的とせずに画面上の複数箇所を指し示す場合を容易に区別す

(22)

特開2003-173237

41

ることができる。

【0233】請求項4、15に記載の発明は、請求項1～3、12～14のいずれかの一に記載の発明において、予め登録されている種類、数又は表示位置で操作画像を表示することができる。

【0234】請求項5、16に記載の発明は、請求項4、15に記載の発明において、表示させる操作画像の詳細についてユーザの所望に登録することができるので、更に操作性を向上させることができる。

【0235】請求項6、17に記載の発明は、請求項1、12に記載の発明において、画面上の指し示し位置の移動により、ユーザは所定の操作を実行することができる。

【0236】請求項7、18に記載の発明は、請求項6、17に記載の発明において、画面上の指し示し位置の移動に応じて、操作画像を操作したように表示させることができる。

【0237】請求項8、19に記載の発明は、請求項1、12に記載の発明において、操作画像を所望のサイズに容易に拡大、縮小して、操作しやすくすることができる。

【0238】請求項9、20に記載の発明は、請求項1、12に記載の発明において、画面上で複数の位置を指し示したときに直ちに操作画像を表示せず、指し示した位置を移動すると徐々に移動する屏の下から操作画像を表示するようにすることができるので、あまり見せたくない操作画像を表示する場合などに好適である。

【0239】請求項10、21に記載の発明は、請求項1～9、12～20のいずれかの一に記載の発明において、操作画像としてアイコン、ダイヤル、スライダバー又はパレットを用いることができる。

【0240】請求項11、22に記載の発明は、請求項1～10、12～21のいずれかの一に記載の発明において、画面上での指し示し方の違いにより、各種の操作画像を選択的に表示させることができる。

【0241】請求項23に記載の発明は、請求項12～22のいずれかの一に記載の発明と同様の効果を奏することができる。

【図面の簡単な説明】

【図1】本発明の実施の一形態である情報入力システムを概略的に示す外観斜視図である。

【図2】情報入力システムに内蔵される各部の電気的接続を示すブロック図である。

【図3】コンピュータに内蔵される各部の電気的接続を示すブロック図である。

【図4】第1の座標入力装置の構成を概略的に示す説明図である。

【図5】光学ユニットの構造を概略的に示す構成図である。

【図6】コントローラのブロック構成図である。

42

【図7】第1の座標入力装置における情報入力領域内の一点を指示部材で指し示した一例を示す正面図である。

【図8】CCDの検出動作を模式的に示す説明図である。

【図9】第2の座標入力装置に用いられる指示部材を示す斜視図である。

【図10】第2の座標入力装置の情報入力領域内の一点を指示部材で指し示した一例を示す正面図である。

【図11】CCDの検出動作を模式的に示す説明図である。

【図12】第3の座標入力装置に用いられる光学ユニットを概略的に示す平面図である。

【図13】第3の座標入力装置の情報入力領域内の一点を指示部材で指し示した一例を示す正面図である。

【図14】光強度と時間との関係を示すグラフである。

【図15】第4の座標入力装置の情報入力領域内の一点を指示部材で指し示した一例を示す正面図である。

【図16】光強度と時間との関係を示すグラフである。

【図17】第5の座標入力装置の構成を概略的に示す正面図である。

【図18】その検出動作を説明するための概略正面図である。

【図19】情報入力システムを用いたアイコン操作について説明する説明図である。

【図20】情報入力システムが行なう処理について説明するフローチャートである。

【図21】情報入力システムで行なう画面操作について説明する正面図である。

【図22】同正面図である。

【図23】複数の位置座標の算出についての説明図である。

【図24】画像判定処理を含む処理の流れを概略的に示すフローチャートである。

【図25】複数の位置座標の算出についての説明図である。

【図26】画像判定処理の流れを概略的に示すフローチャートである。

【図27】座標ベクトル値算出方法を説明するためのベクトル図である。

【図28】ベクトルテーブルを模式的に示す説明図である。

【図29】直線を描く場合の動きを示す説明図である。

【図30】直線方向を大きく変化させて描く場合の動きを示す説明図である。

【図31】画像を自動的に確定することができる状態を示す説明図である。

【図32】一の指示部材で記述している途中において、他の指示部材が情報入力領域内に挿入された状態を示す説明図である。

【図33】情報入力システムを用いたダイヤル操作に

(23)

特開2003-173237

43

44

ついて説明する説明図である。

【図34】ダイアル操作の処理のフローチャートである。

【図35】ダイアル操作の際の座標検出について説明する説明図である。

【図36】ダイアル操作の際の座標検出について説明する説明図である。

【図37】ダイアル操作の際に行なう演算についての説明図である。

【図38】情報入出力システムを用いた扉とパレットの操作について説明する説明図である。

【図39】扉とパレットの操作の処理について説明するフローチャートである。

【図40】扉とパレットの操作の際の座標検出について説明する説明図である。

【図41】扉とパレットの操作の際に行なう演算について説明する説明図である。

【図42】情報入出力システムを用いたパレットの操作について説明する説明図である。

【図43】パレットの操作の処理について説明するフローチャートである。

【図44】パレットの操作の際の座標検出について説明する説明図である。

【図45】パレットの操作の際の座標検出について説明する説明図である。

【図46】パレットの操作の際の座標検出について説明する説明図である。

【図47】情報入出力システムを用いたスライダバーの操作について説明する説明図である。

【図48】スライダバーの操作の処理について説明する

＊るフローチャートである。

【図49】スライダバーの操作の際の座標検出について説明する説明図である。

【図50】スライダバーの操作の際の座標検出について説明する説明図である。

【図51】操作画像の選択について説明するフローチャートである。

【図52】情報入出力システムを用いたオブジェクトの拡大、縮小操作について説明する説明図である。

【図53】オブジェクトの拡大、縮小操作について説明するフローチャートである。

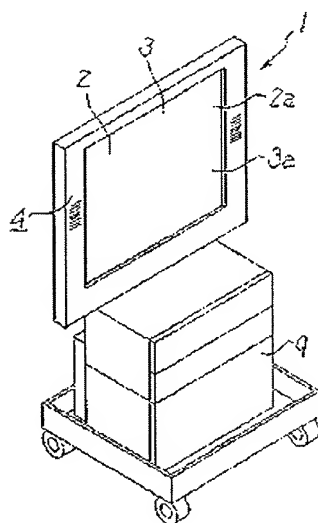
【図54】パレットの表示について説明する説明図である。

【図55】スライダバーの表示について説明する説明図である。

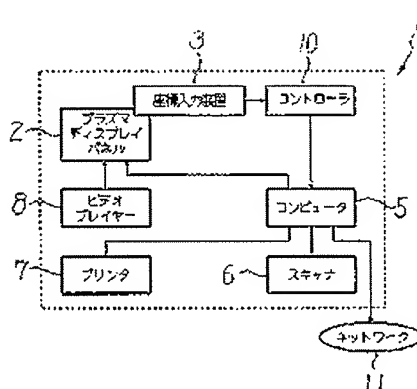
【符号の説明】

- 1 情報入出力システム
- 2 表示装置
- 2a 画面
- 3 座標入力装置
- 4 入出力装置
- 17 記憶装置
- 26 記憶媒体
- 94 操作画像、アイコン
- 101 操作画像、ダイアル
- 102 扉
- 103 操作画像、パレット
- 104 操作画像、パレット
- 105 操作画像、スライダバー
- 106 操作画像

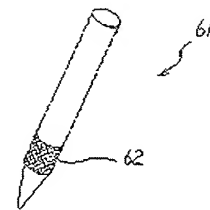
【図1】



【図2】



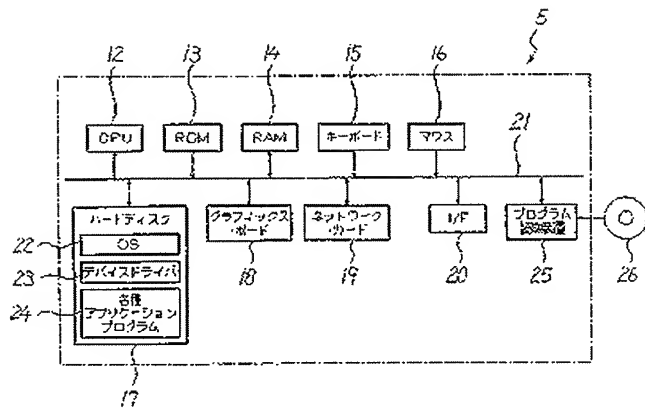
【図9】



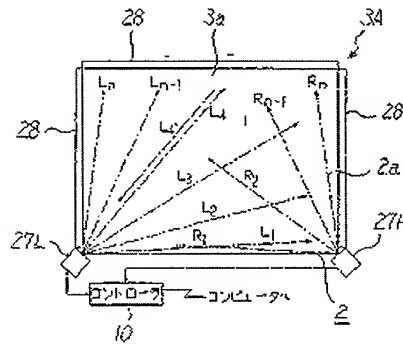
(24)

特開2003-173237

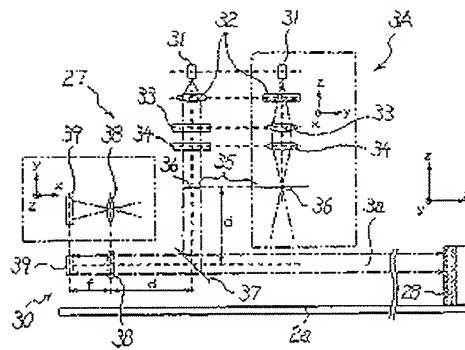
【図3】



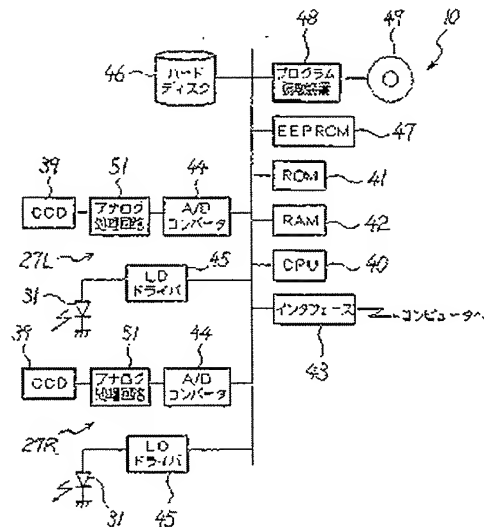
【図4】



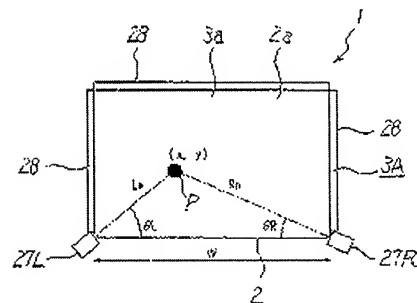
【図5】



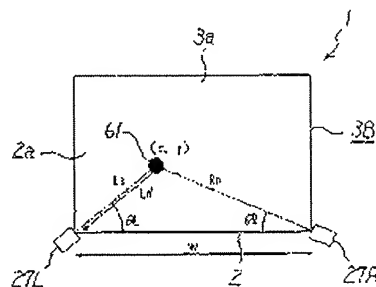
【図6】



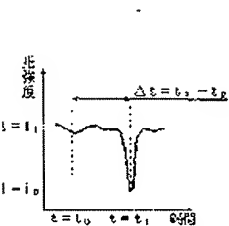
【図7】



【図10】



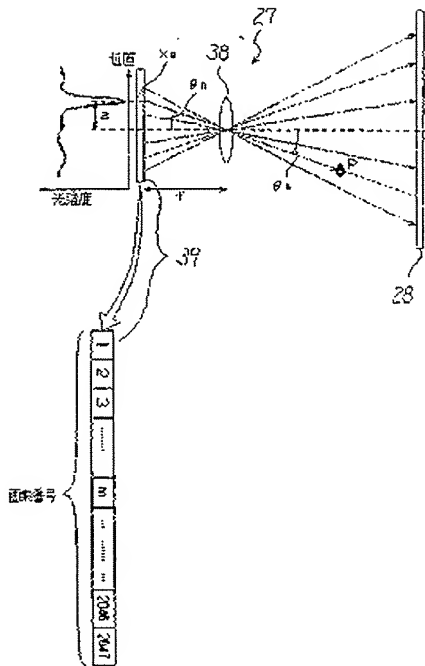
【図14】



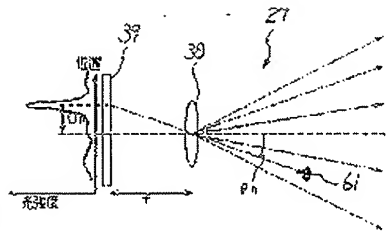
(25)

特開2003-173237

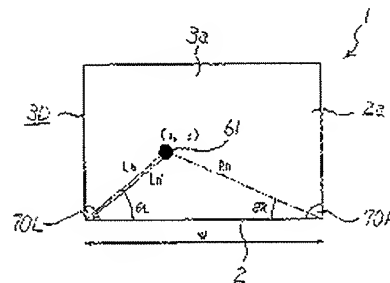
【図8】



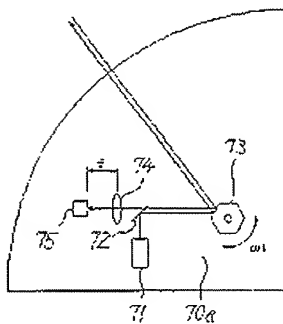
【図11】



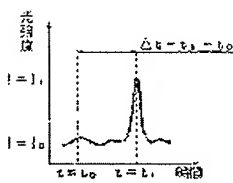
【図15】



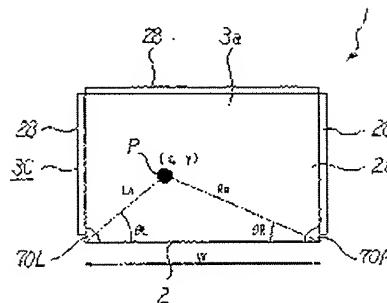
【図12】



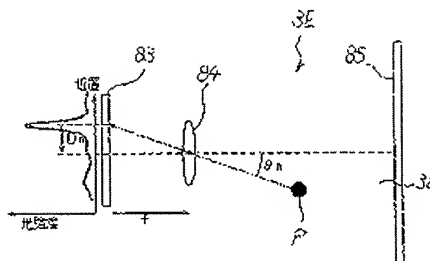
【図16】



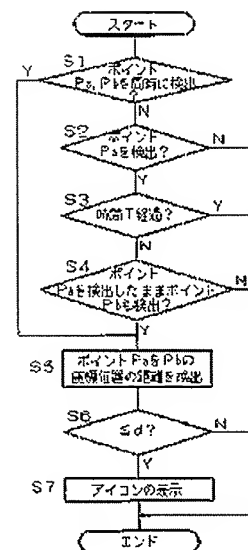
【図13】



【図18】



【図20】

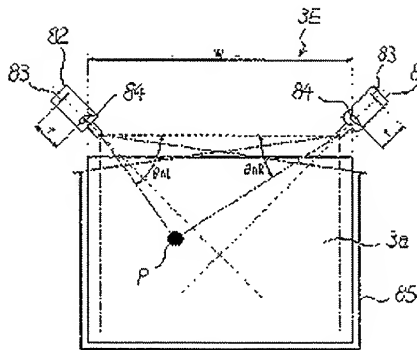




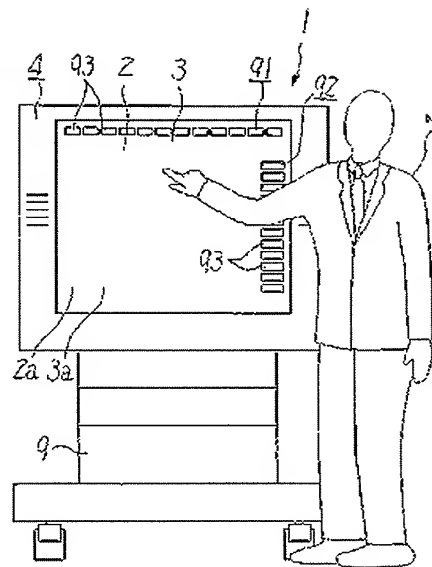
(26)

特開2003-173237

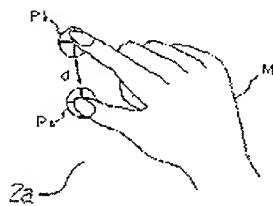
【图 17】



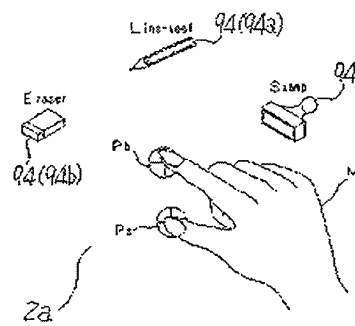
【图19】



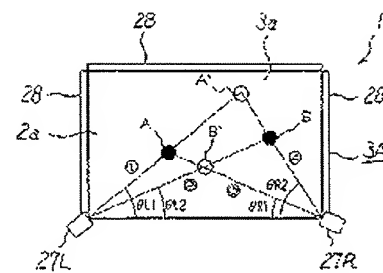
【图 21】



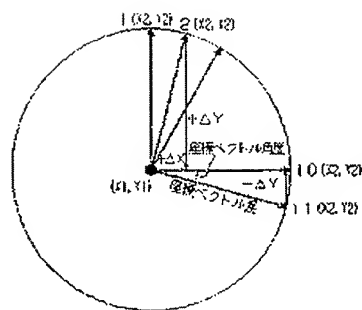
【図22】



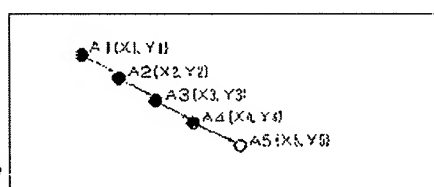
【图23】



【圖27】



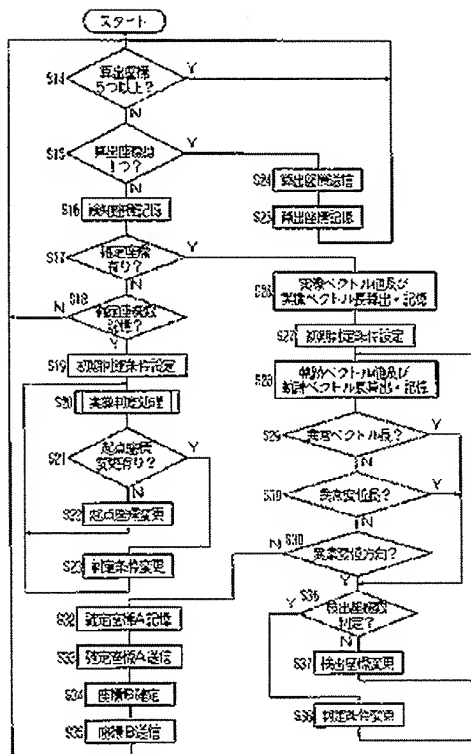
【例29】



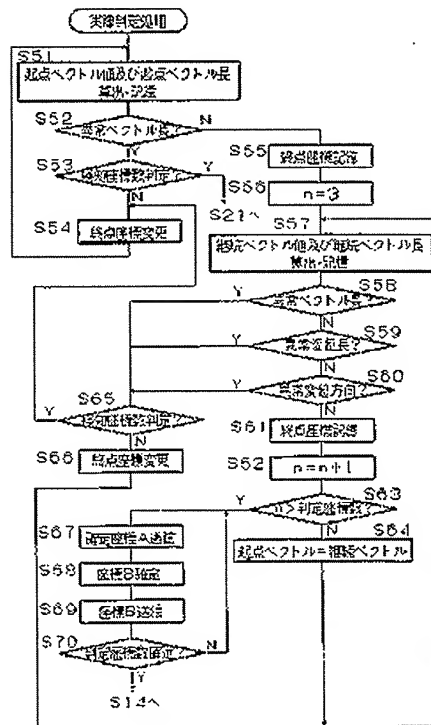
(27)

特開2003-173237

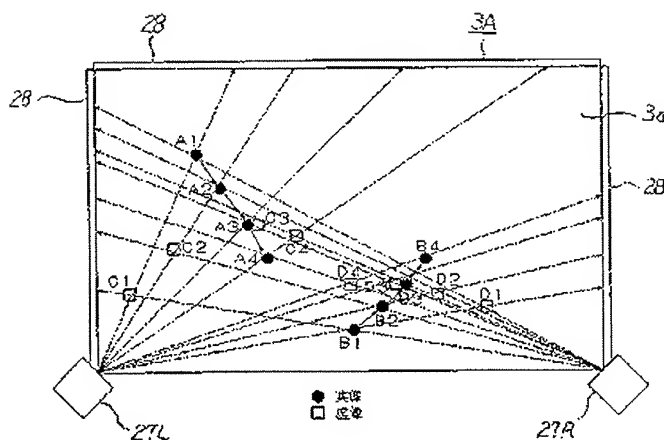
【図24】



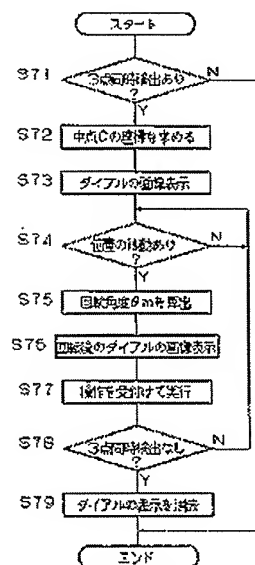
【図26】



【図25】



【図34】



(28)

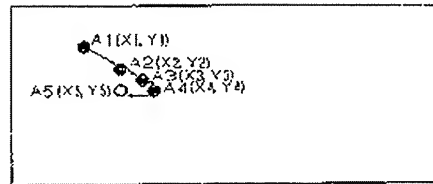
特開2003-173237

【図28】

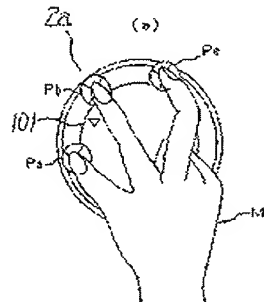
TB

座標ベクトル値	$\Delta X$	$\Delta Y$	$\Delta Y/\Delta X$	座標ベクトル角値
1	0	+	∞	90°
2	+	+	5.671 (tan80°)	80°
3	+	+	2.747 (tan70°)	70°
4	+	+	1.732 (tan60°)	60°
5	+	+	1.192 (tan50°)	50°
6	+	+	0.839 (tan40°)	40°
7	+	+	0.577 (tan30°)	30°
8	+	+	0.364 (tan20°)	20°
9	+	+	0.176 (tan10°)	10°
10	+	0	0 (tan0°)	0°
11	+	-	-0.176 (tan-10°)	10°
12	+	-	-0.364 (tan-20°)	20°
13	+	-	-0.577 (tan-30°)	30°
14	+	-	-0.839 (tan-40°)	40°
15	+	-	-1.192 (tan-50°)	50°
16	+	-	-1.732 (tan-60°)	60°
17	+	-	-2.747 (tan-70°)	70°
18	+	-	-5.671 (tan-80°)	80°
19	0	-	∞	90°
20	-	-	5.671 (tan80°)	80°
21	-	-	2.747 (tan70°)	70°
22	-	-	1.732 (tan60°)	60°
23	-	-	1.192 (tan50°)	50°
24	-	-	0.839 (tan40°)	40°
25	-	-	0.577 (tan30°)	30°
26	-	-	0.364 (tan20°)	20°
27	-	-	0.176 (tan10°)	10°
28	-	0	0 (tan0°)	0°
29	-	+	0.176 (tan10°)	10°
30	-	+	0.364 (tan20°)	20°
31	-	+	0.577 (tan30°)	30°
32	-	+	0.839 (tan40°)	40°
33	-	+	1.192 (tan50°)	50°
34	-	+	1.732 (tan60°)	60°
35	-	+	2.747 (tan70°)	70°
36	-	+	5.671 (tan80°)	80°

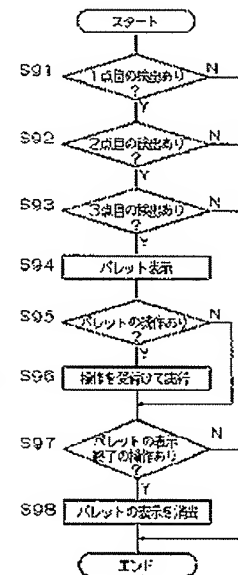
【図30】



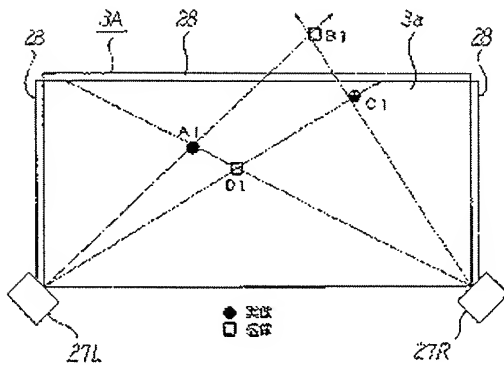
【図33】



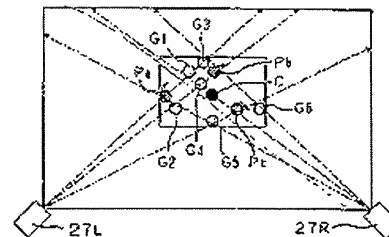
【図43】



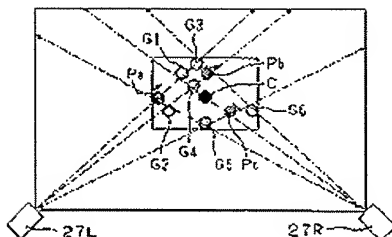
【図31】



【図36】



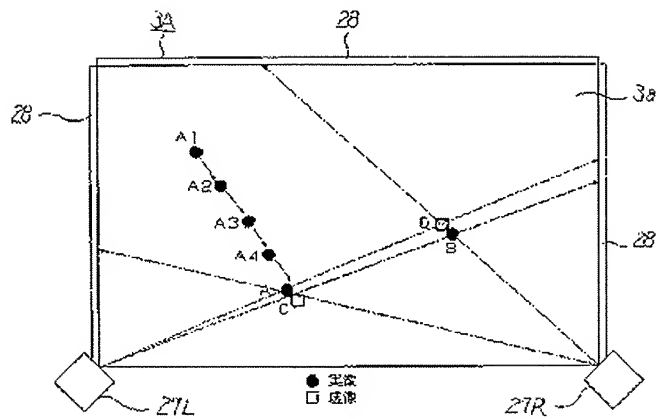
【図35】



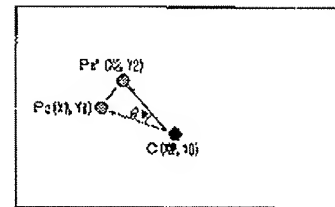
(29)

特開2003-173237

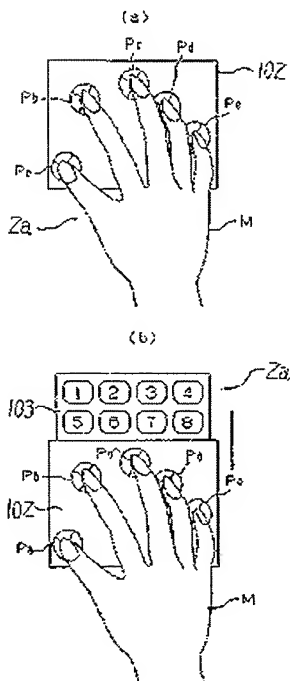
【図32】



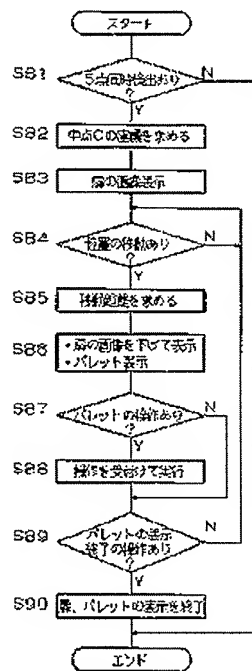
【図37】



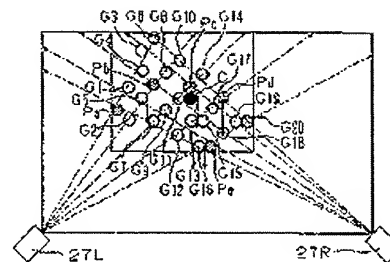
【図38】



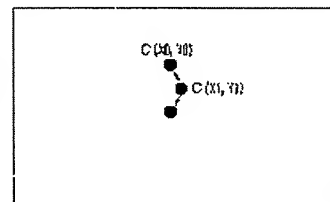
【図39】



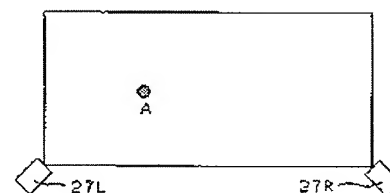
【図40】



【図41】



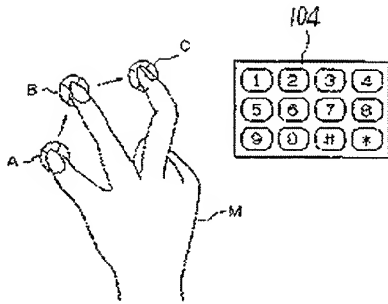
【図44】



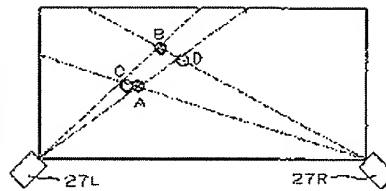
(30)

特開2003-173237

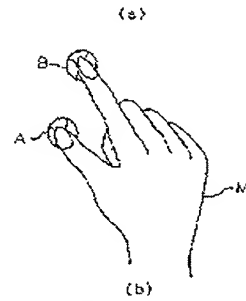
【図42】



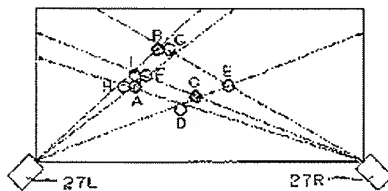
【図45】



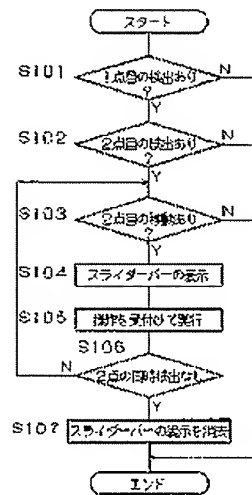
【図47】



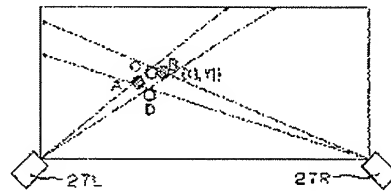
【図46】



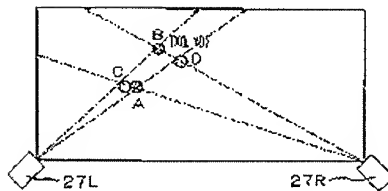
【図48】



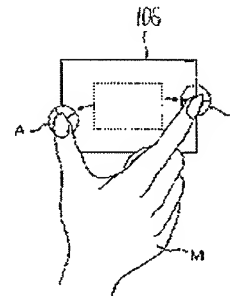
【図50】



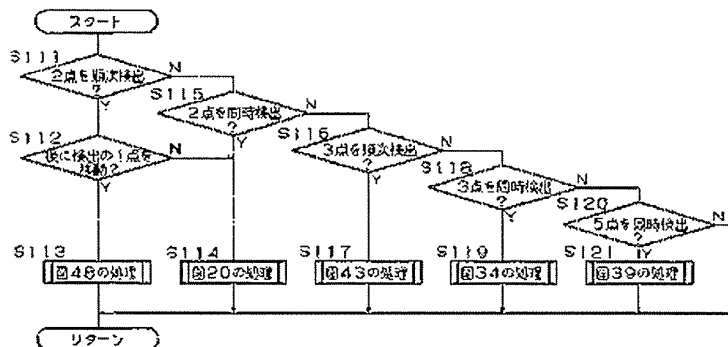
【図49】



【図52】



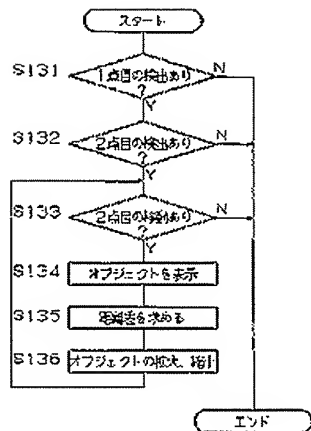
【図51】



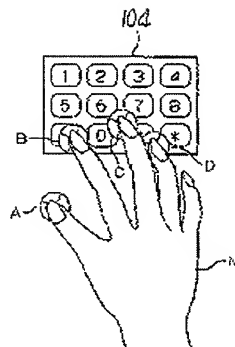
(31)

特開2003-173237

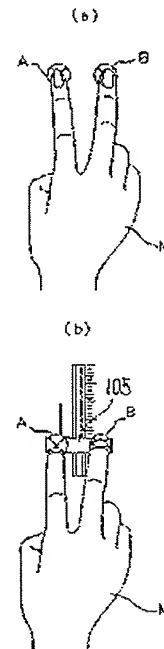
【図53】



【図54】



【図55】



フロントページの続き

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					5 2 0 E
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5B087 AA09 AB02 CC26 DE03 DJ01					
DJ09					
5C082 AA13 AA24 BB13 BB42 BD00					
CA32 CA76 CB05 DA22 DA42					
DA86 DD09					
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